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USER GUIDE
UGE064-0907

Medline Combination Puller/Cutter

CMSC Model

Please record your equipment's model and serial number(s) and the date you received it in the spaces provided.

It's a good idea to record the model and serial number(s) of your equipment and the date you received it in the User Guide. Our service department uses this information, along with the manual number, to provide help for the specific equipment you installed.

Please keep this User Guide and all manuals, engineering prints and parts lists together for documentation of your equipment.

Date:

Manual Number: UGE0604-0907

Serial Number(s):

Model Number(s):

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Introduction

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Purpose of the User Guide

This User Guide describes the Conair Medline Combination Puller/Cutter and explains step-by-step how to install, operate, maintain and repair this equipment.

Before installing this product, please take a few moments to read the User Guide and review the diagrams and safety information in the instruction packet. You also should review manuals covering associated equipment in your system. This review won't take long, and it could save you valuable installation and operating time later.

How the Guide is Organized

Symbols have been used to help organize the User Guide and call your attention to important information regarding safe installation and operation.

⚠ Symbols within triangles warn of conditions that could be hazardous to users or could damage equipment. Read and take precautions before proceeding.

1 Numbers indicate tasks or steps to be performed by the user.

◆ A diamond indicates the equipment's response to an action performed by the user.

❒ An open box marks items in a checklist.

• A circle marks items in a list.

Indicates a tip. A tip is used to provide you with a suggestion that will help you with the maintenance and operation of this equipment.

Indicates a note. A note is used to provide additional information about the steps you are following throughout this manual.

Your Responsibility as a User

You must be familiar with all safety procedures concerning installation, operation and maintenance of this equipment. Responsible safety procedures include:

- Thorough review of this User Guide, paying particular attention to hazard warnings, appendices and related diagrams.
- Thorough review of the equipment itself, with careful attention to voltage sources, intended use and warning labels.
- Thorough review of instruction manuals for associated equipment.
- Step-by-step adherence to instructions outlined in this User Guide.

ATTENTION:
Read this so no one gets hurt

We design equipment with the user's safety in mind. You can avoid the potential hazards identified on this machine by following the procedures outlined below and elsewhere in the User Guide.

⚠ WARNING: Improper installation, operation or servicing may result in equipment damage or personal injury.

This equipment should be installed, adjusted, and serviced by qualified technical personnel who are familiar with the construction, operation and potential hazards of this type of machine.

All wiring, disconnects and fuses should be installed by qualified electrical technicians in accordance with electrical codes in your region. Always maintain a safe ground. Do not operate the equipment at power levels other than what is specified on the the machine serial tag and data plate.

WARNING: Voltage hazard

This equipment is powered by three-phase alternating current, as specified on the machine serial tag and data plate.

A properly sized conductive ground wire from the incoming power supply must be connected to the chassis ground terminal inside the electrical enclosure. Improper grounding can result in severe personal injury and erratic machine operation.

Always disconnect and lock out the incoming main power source before opening the electrical enclosure or performing non-standard operating procedures, such as routine maintenance. Only qualified personnel should perform troubleshooting procedures that require access to the electrical enclosure while power is on.

(continued)

ATTENTION:
Read this so no one gets hurt

(continued)

We design equipment with the user's safety in mind. You can avoid the potential hazards identified on this machine by following the procedures outlined below and elsewhere in the User Guide.

WARNING: Pinch hazard

Never remove or disable safety devices to sustain production. Operating without these devices could lead to hazardous conditions that can cause severe injury.

- Walk-through style belt guards which protect from injury, but also, allow side entry for ease of operation. Upper and lower belt guards independently protect the operator from being caught in the belts or associated driven sheaves (sprockets).

- The power cord is attached to the upper guard by a receptacle on the rear side of the guard. You must disconnect this power cord to remove the upper belt guard, ensuring that the puller will not start if the upper guard is not in place.

- The flip up safety switch on the discharge end of the upper belt guard allows operation only when in the down position. If a finger or piece of clothing is caught on the upper belt and drawn in, the guard flips up and immediately shuts off the power to the entire combination puller/cutter.

- The "Emergency Stop" button is located on the control panel and on top of the upper belt guard at the upstream end. Pressing either of these buttons disconnects power to the entire unit. The "Emergency Stop" must be physically pulled up to reset the switch and start the combination puller/cutter again.

- When the knife guard is opened, the knife guard switch stops the cutter.

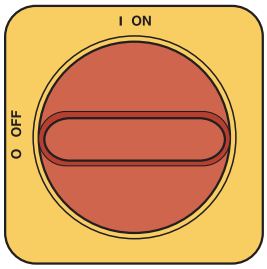
- Two proximity safety switches prevent cutter operation unless the cutter bushings are in place.

- The "Stop" button on the puller and cutter controls activates a circuit that stops the puller and cutter knife.

How to Use the Lockout Device

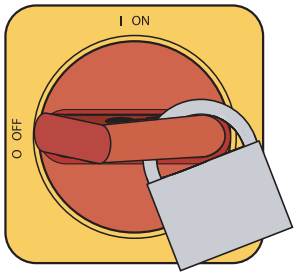
⚠ **CAUTION:** Before performing maintenance or repairs on this product, you should disconnect and lockout electrical power sources to prevent injury from unexpected energization or start-up. A lockable device has been provided to isolate this product from potentially hazardous electricity.

Lockout is the preferred method of isolating machines or equipment from energy sources. Your Conair product is equipped with the lockout device pictured below.



To use the lockout device:

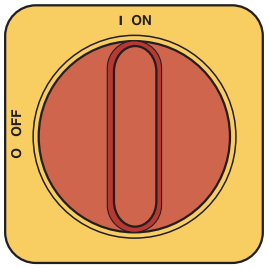
1. **Stop or turn off the equipment.**
2. **Isolate the equipment from the electric power.** Turn the rotary disconnect switch to the OFF, or "O" position.
3. **Secure the device with an assigned lock or tag.** Insert a lock or tag in the holes to prevent movement.
4. **The equipment is now locked out.**



WARNING: Before removing lockout devices and returning switches to the ON position, make sure that all personnel are clear of the machine, tools have been removed, and all safety guards reinstalled.

To restore power to the dryer, turn the rotary disconnect back to the ON position:

1. **Remove the lock or tag.**
2. **Turn the rotary disconnect switch to the ON or "I" position.**



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What is the Medical Combination Puller/Cutter?

The Conair Medline Combination Puller/Cutter pulls small extruded tubing through sizing and/or cooling tanks and cuts the product to lengths. Since the puller and cutter are mounted on the same chassis, alignment problems are minimized.

The puller portion's dual servo drive system offers extremely accurate speed control. Different puller belt materials optimize performance with different types of extruded materials, or applications.

The cutter portion utilizes a position-controlled servo motor. CSC units achieve park position repeatability less than 0.1 millisecond.

Typical Applications

Conair Medical Combination Puller/Cutters process extrudable plastics on-line.

While the standard orientation is right-to-left, combination puller/cutters can also be made with a left-to-right orientation. *See Description Section entitled, Specifications: Medline Combination Puller/Cutter.* (The illustrations in this User Guide represent the standard right-to left configuration.)

CSC cutters are limited to a specific range of product sizes based on each unit's cutting capacity. CSC cutters can operate over a range of speeds (depending on which options are included.) *See Description Section entitled, Specifications: Medline Combination Puller/Cutter.*

Profile/Bubble/Taper tubing can be processed with the optional touchscreen and Profile/Bubble/Taper software. With this option, it is recommended to use sponge belts.

Limitations

- Because the maximum distance between the puller and cutter is only 6 inches {152.4 mm}, the combination puller/cutter is not suitable for larger rigid extruded parts.

- The unit is limited by the traction length (the length over which the extrudate is in contact with the puller belts), which is fixed for particular models.

- The outer surface of the puller belt material will affect performance. Softer (low durometer) materials provide good “grab”, but will wear more quickly, and may tear if the belt jams. Harder (high durometer) materials last longer, but may not grab the extrudate properly.

Contact Conair for specific belt material recommendations for your product.

How the Combination Puller/Cutter Works

First, the extruded material that has been sized and cooled enters the combination puller/cutter from the upstream side. The extrudate passes through and is positioned by guide rollers.

Then, the two opposing belts move the extrudate through the puller. These belts have grooves that fit teeth on the puller's sheaves (sprockets), preventing side-to-side movement. Belt coverings are available in a variety of materials for specific applications. Walk-through style belt guards ensure operator safety while allowing access to the belts. The belt speed is controlled by eye-level controls.

A threaded rod controls the distance between the upper and lower belts. The top and bottom belts open from a common, fixed center. Rubber grommets, on the CPC 1-12, allow the upper belt to 'give' slightly, preventing the puller from being damaged by small lumps of extrudate or other foreign objects.

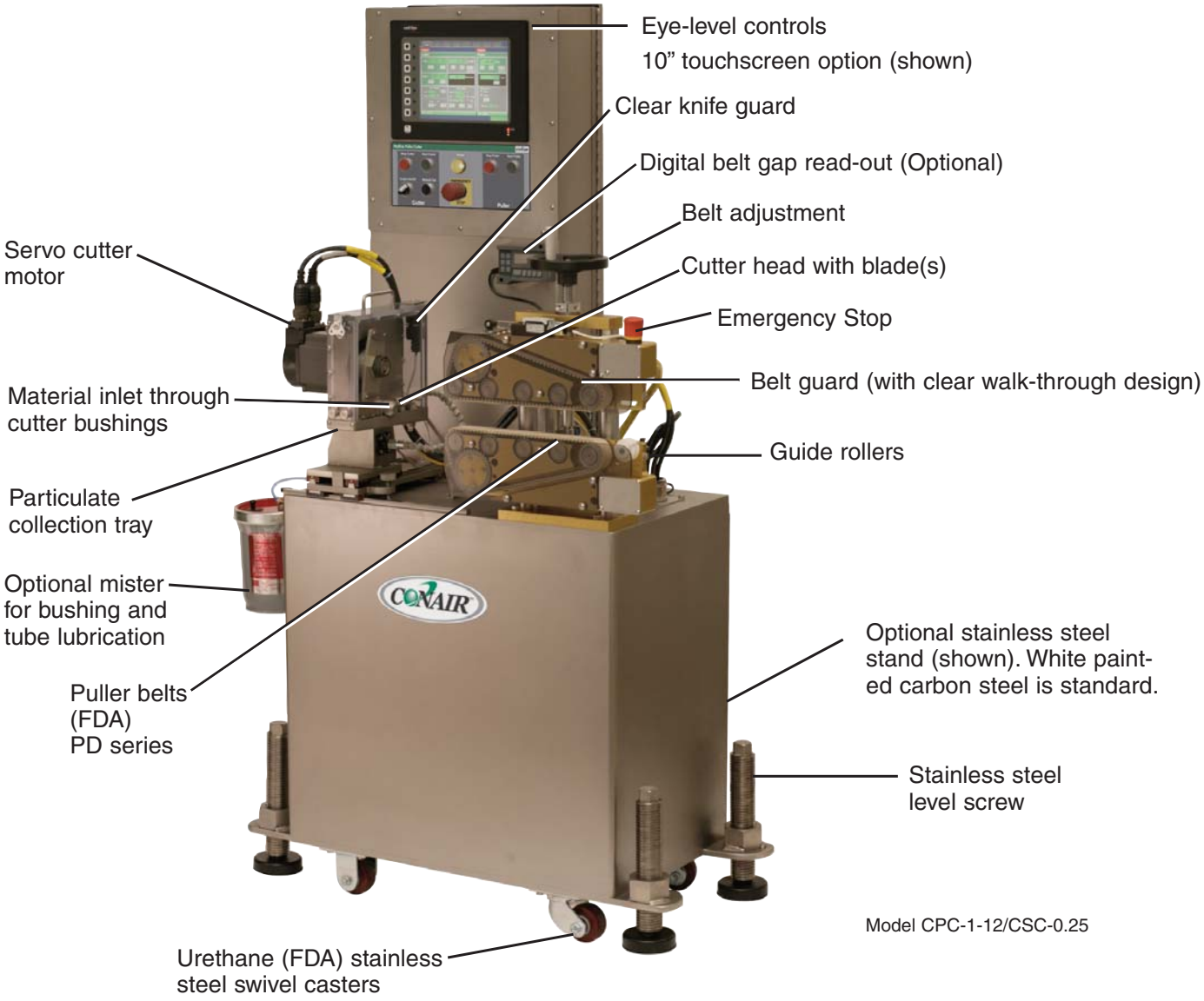
After passing through the belts, the extrudated material continues on to the cutter. The cutter is mounted on linear slides that allow as much as 6 inches {152.4 mm} of movement. The cutter can be moved away from the puller for startup, then moved close to the puller to enhance delivery to the cutter bushings.

Next, the cutter's servo motor, which is positionally controlled, operates the cutter head and knife that is attached directly to the servo motor using a Trantorque coupling device. Two cutter bushings guide and support both the extrudate and the cutting knife. The extrudate passes through the cutter bushings and is cut by the rotating cutter head.

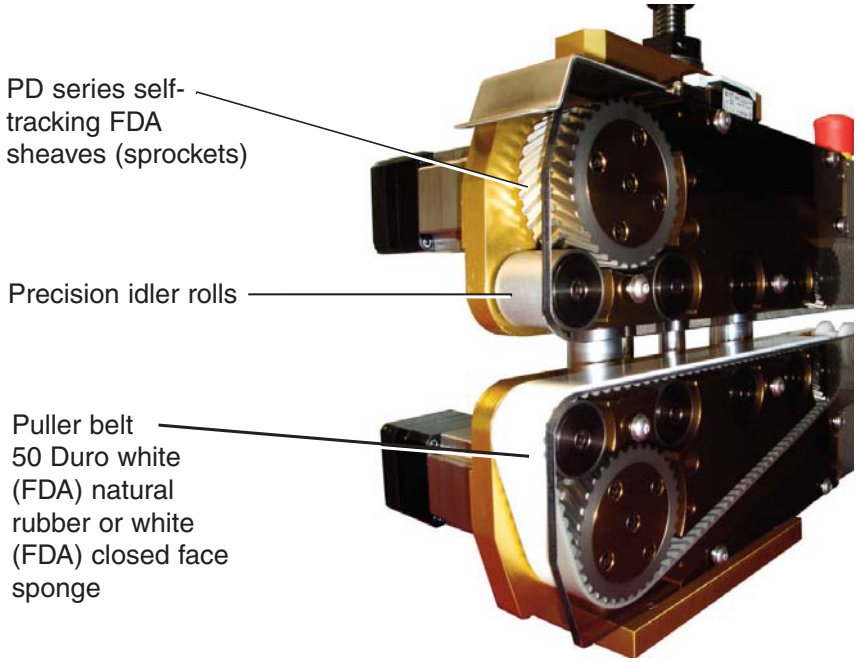
The cut pieces are collected or carried on to further processing by an optional conveyor. (Take Away/Blow Off Conveyor)

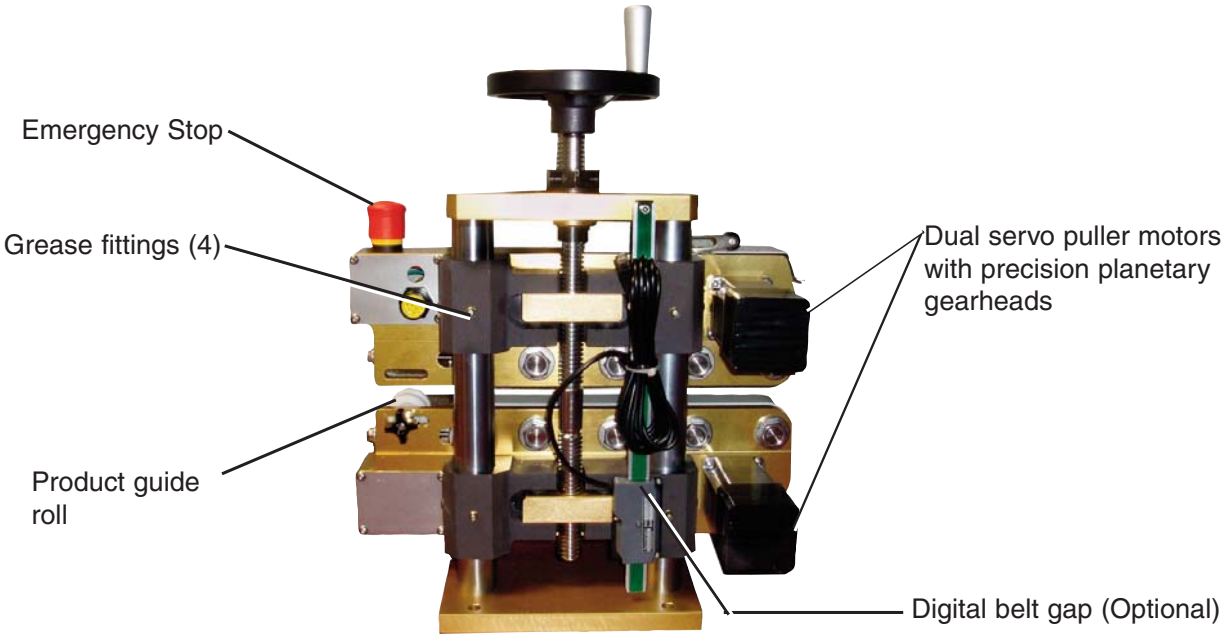
(continued)

How the Combination Puller/Cutter Works (continued)


Eye-level controls
10” touchscreen option (shown)
Clear knife guard
Digital belt gap read-out (Optional)
Belt adjustment
Servo cutter motor
Cutter head with blade(s)
Emergency Stop
Material inlet through cutter bushings
Belt guard (with clear walk-through design)
Guide rollers
Particulate collection tray
Optional mister for bushing and tube lubrication
Optional stainless steel stand (shown). White painted carbon steel is standard.
Puller belts (FDA) PD series
Stainless steel level screw
Model CPC-1-12/CSC-0.25
Urethane (FDA) stainless steel swivel casters

How the Combination Puller/Cutter Works (continued)

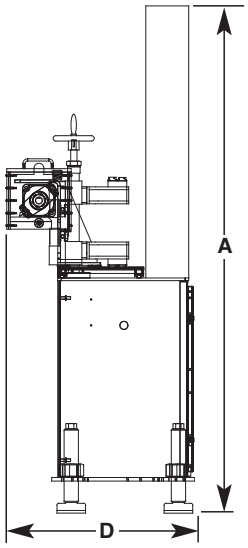

PD series self-tracking FDA sheaves (sprockets)
Precision idler rolls
Puller belt 50 Duro white (FDA) natural rubber or white (FDA) closed face sponge

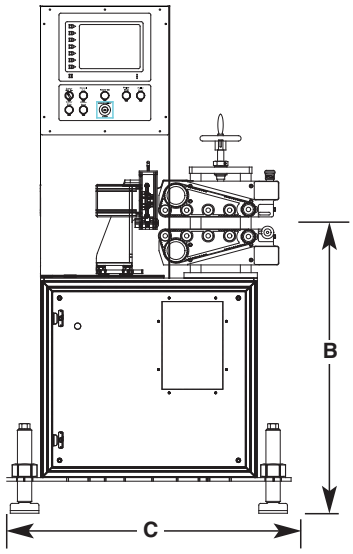

Emergency Stop
Grease fittings (4)
Product guide roll
Dual servo puller motors with precision planetary gearheads
Digital belt gap (Optional)

CPC-1-12 puller model shown

Specifications: Medline Combination Puller/Cutter

MODELS	CPC-1-12/CSC-0.25L
Performance characteristics	
Extrudate capacity in. {mm} dia.	0.25 {6.35}
Blade drive motor (3000 rpm)	
CSC cutter Hp {kW}	2.46 {1.83}
Servo puller drive motor Hp {kW}	(2) 0.43 {0.32}
Dimensions in. {mm}	
A - Height	71.0 {1803.4}
B - Height to centerline, ±2 {±50.8}	42.0 {1067}
C - Width	40.0 {1016}
D - Depth	27.0 {685.8}
Belt width ±3/8 {±9.5}	1.0 {25.4}
Belt traction length	12.0 {304.8}
Feed opening	2.0 {50.8}
Weight lb {kg}	
Installed	715 {324}
Shipping	800 {363}
Electrical requirements Full Load Amps	
Drive type(Puller)	Dual Servo with precision planetary gearhead
	(2) 0.43 Hp
230V/3 phase/60Hz	20
460V/3 phase/60Hz	12
Cutter Control	**Red Lion**





SPECIFICATION NOTES

Specifications may change without notice. Check with a Conair representative for the most current information.

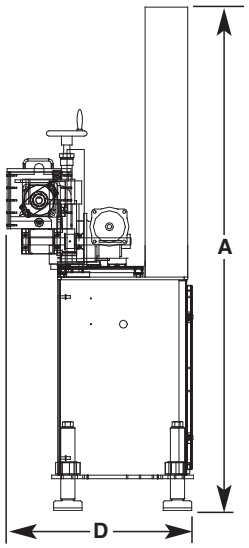
TPES016-1206-REV

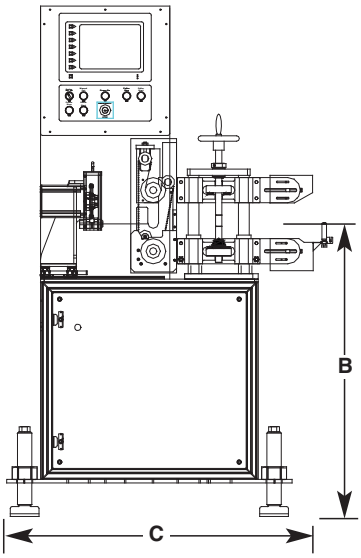
OPTIONS

- 10 inch touchscreen control (in place of standard 6 inch screen)
- Profile/Bubble/Taper software
- Stainless steel cabinet
- Digital gap readout

(continued)

Specifications: Medline Combination Puller/Cutter (continued)





MODELS	CPC-3-20/CSC-0.25L	
Performance characteristics		
Extrudate capacity in. {mm} dia.	0.25 {6.35}	
Blade drive motor (3000 rpm)		
CSC cutter Hp {kW}	2.7 {2.01}	
Puller drive motor Hp {kW}	1 (0.75}	
Optional Servo drive motor Hp {kW}	2.46 {1.83}	
Dimensions in. {mm}		
A - Height	71.0 {1803.4}	
B - Height to centerline, ±2 {±50.8}	42.0 {1067}	
C - Width	45.0 {1143}	
D - Depth	27.0 {685.8}	
Belt width ±3/8 {±9.5}	3.0 {76.2}	
Belt traction length	20.0 {508}	
Feed opening	4.0 {102}	
Weight lb {kg}		
Installed	735 {333}	
Shipping	820 {372}	
Electrical requirements Full Load Amps		
Drive type(Puller)	Closed Loop	Servo
	1.0 Hp	2.46Hp
230V/3 phase/60Hz	19.7	33.6
460V/3 phase/60Hz	10.5	16.8
Cutter Control	**Red Lion**	

SPECIFICATION NOTES

Specifications may change without notice. Check with a Conair representative for the most current information.

TPES016-1206-REV

OPTIONS

- Servo drive motor
- Stainless steel cabinet

Puller Optional Equipment

- **Digital belt gap sensor and readout** - (Optional) Allows the operator to set a zero point, then measure belt gap (in thousandths of an inch) relative to this setpoint.

- **Remote belt speed control** - (Optional) Allows the puller speed to be controlled by an external source. (Remote Digital Potentiometer)

- **In-line planetary gear reducer ratios** - A particular reducer ratio is selected at the time of purchase to optimize puller performance in a particular speed range. Contact a Conair Representative for application specific gear reducers

Cutter Optional Equipment

- **Cutter bushing lubrication** - (Optional) A self-contained spray system, which includes a reservoir and an air inlet for operation at 20-30 psi (air source not included). A flexible nozzle directs lubricant onto the extrudate as it enters the cutter bushings. This decreases bushing drag and helps lubricate the blade. This option is recommended for processing sticky/soft (low durometer) materials.

- **Cutter blade wipe** - (Optional) Keeps the cutting blade clean by removing lubricant and particles. A reservoir chamber with a flexible drip tube feeds lubricant to a felt pad sandwiched between two pieces of stainless steel in the particulate tray. The pad wipes and lubricates the knife before each cut.

- **Profile/Bubble/ Taper software upgrade package** - The standard serial operator interface units are replaced with a common color touchscreen operator interface. A positional control unit is added to the puller servo drive, along with a PLC (Programmable Logic Controller) enabling positional moves needed for Profile/Bubble/Taper tubing processing. Basic output package enables operation for up to two lumens with 32 points of analog outputs each. Specialized software for processing Profile/Bubble/Taper tubing includes: up to 32 preset positional moves for input speed and distance, 24 VDC output for blow off, four digital powered outputs - 24 VDC transistorized 0.25 amps each and two 0 to 10 VDC analog outputs.

- **Main cabinet housing** - (Optional) Stainless steel in place of standard white painted carbon steel cabinet.

(continued)

Cutter Optional Equipment (continued)

- **Follower cutting Mode** - Follower Mode allows the operator to program the desired cut length and the number of blades. The controller then automatically follows the puller and adjusts the speed of the flywheel to maintain cut length accuracy. This is known as an electronic gear lock system. The cut length accuracy is maintained even if the puller changes speed.

Common Optional Equipment

- **Discharge conveyor** - A discharge conveyor offers support before, during, and after cutting, and facilitates the removal of cut parts. Discharge conveyors are available in the following sizes:

- 6 inches wide by 6 feet long
- 6 inches wide by 12 feet long
- 6 inches wide by 16 feet long

- **Isolation Transformer** - The isolation transformer protects sensitive electronics from incoming power, which helps prevent errors caused by electrical noise. It also protects equipment from electrical noise generated by the servo motor and associated amplifiers.

NOTE: Conair strongly recommends using an isolation transformer. Ensuring clean and proper power can help avoid the need for costly service calls.

NOTE: An isolation transformer will not compensate for a ground that does not meet code requirements.

- **Left-to-Right machine operation** - This option changes the machine direction . from the standard right-to-left extrusion flow to left-to-right.

Your Conair sales representative can analyze your needs and recommend the options that are right for your system.

SECTION
3

Installation

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Unpacking the Boxes

The Conair Medline Combination Puller/Cutter comes fully assembled in a single crate.

⚠ CAUTION: Lifting

To avoid personal injury or damage to the puller/cutter, lift the puller/ cutter using a forklift or hoist with straps that have been positioned at the puller/cutter's center of gravity.

To uncrate the Medline Combination Puller/Cutter:

1. **Carefully uncrate the puller/cutter and its components.**

2. **Remove all packing material,** protective paper, tape, and plastic. Compare contents to the shipping papers to ensure that you have all the parts.

3. **Carefully inspect all components** to make sure no damage occurred during shipping. Check all wire terminal connections, bolts, and any other electrical connections, which may have come loose during shipping.

4. **Record serial numbers and specifications** in the blanks provided on the back of the User Guide's title page. This information will be helpful if you ever need service or parts.

5. **You are now ready to begin installation.** *See Installation Section entitled, Preparing for Installation.*

Preparing for Installation

1 You will need these tools for installation:

- ❒ **wire strain relief**
- ❒ **16 or 18 inch adjustable wrench**
- ❒ **set of Allen wrenches**
- ❒ **set of Feeler gauges**
- ❒ **1/2 inch open or box end wrench**
- ❒ **flashlight**.

2 Plan the location. Make sure the area where the Medline Combination Puller/Cutter is installed has the following:

❒ **A grounded power source.**
Check the puller/cutter's serial tag for the correct amps, voltage, phase and cycles. All wiring should be completed by qualified personnel and should comply with your region's electrical codes.

❒ **Clearance for safe operation and maintenance.**
Make sure there is enough clearance around the servo cutter for maintenance and servicing. If the cutter portion has the optional slide base, be sure to check for clearance by extending the slide system in both directions.

⚠ **WARNING: Improper installation, operation, or servicing may result in equipment damage or personal injury.**

This equipment should only be installed, adjusted, and serviced by qualified technical personnel who are familiar with the construction, operation, and potential hazards of this type of machine.

All wiring, disconnects, and fuses should be installed by qualified electrical technicians in accordance with electrical codes in your region. Always maintain a safe ground. Do not operate the equipment at power levels other than what is specified on the machine serial tag and data plate.

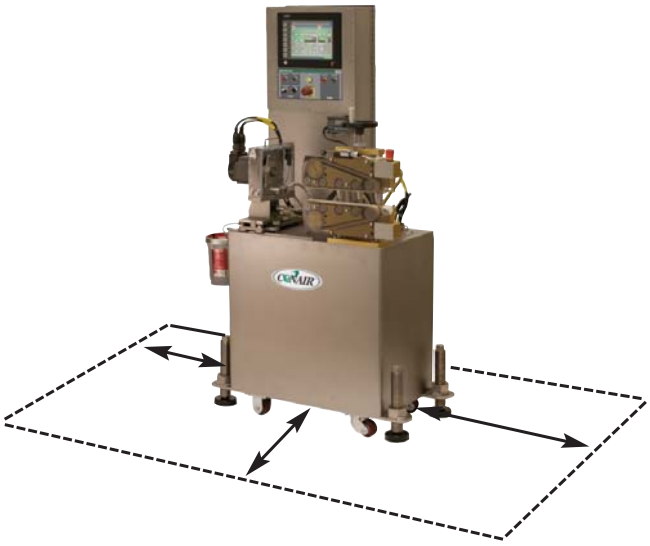
Positioning the Medline Combination Puller/Cutter

1 **Move the Medline Combination Puller/Cutter into position.** Place the puller/cutter in position downstream of the last sizing or cooling tank.

⚠ **CAUTION: Lifting**

To avoid personal injury or damage to the cutter, lift the cutter using a fork-lift or hoist with straps that have been positioned at the combo's center of gravity.

2 **Align the puller/cutter with the extrusion line.**



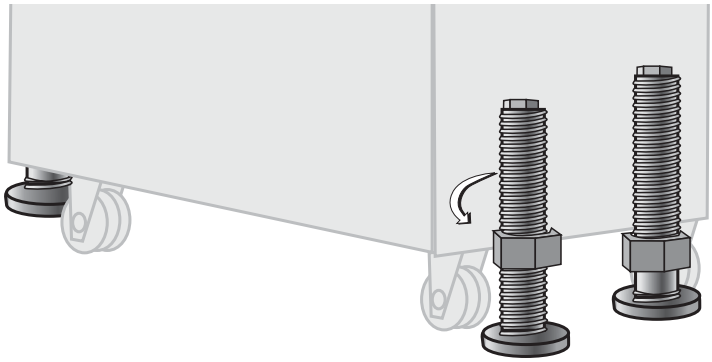
(continued)

Positioning the Medline Combination Puller/Cutter (continued)

3 **Measure the centerline height** of the extrudate as it exits the extrusion die. Adjust all equipment on the extrusion line (sizing tank, cooling tanks, puller/cutter) to this height.

4 **Adjust the puller/cutter's floor lock/caster assembly** to the center height of the extrusion line using a 16 or 18-inch adjustable wrench. Remove the weight from the casters by locking down the floor locks.

IMPORTANT: Never leave the puller/cutter on casters only.



5 **Use a plumb line or laser to check for a straight line** from the extrusion die through each line component to the cutter bushings. Adjust as necessary.

6 **Adjust the belt puller entrance guide rollers** to insure consistent product guidance.

Connecting the Main Power Source

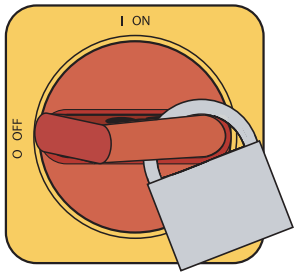
WARNING: Electrical hazard

Before performing maintenance or repairs on this product, disconnect and lock out electrical power sources to prevent injury from unexpected energization or start-up. A lockable device has been provided to isolate this product from potentially hazardous electricity.

WARNING: Improper installation, operation, or servicing may result in equipment damage or personal injury.

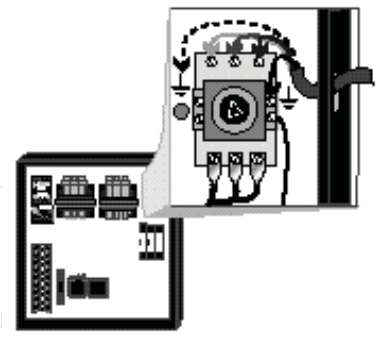
This equipment should only be installed, adjusted, and serviced by qualified technical personnel who are familiar with the construction, operation, and potential hazards of this type of machine.

All wiring, disconnects, and fuses should be installed by qualified electrical technicians in accordance with electrical codes in your region. Always maintain a safe ground. Do not operate the equipment at power levels other than what is specified on the machine serial tag and data plate.



IMPORTANT: Always refer to the wiring diagrams that came with your combination puller/cutter before making electrical connections. The diagrams show the minimum size main power cable required for your machine, and the most accurate electrical component information.

1. **Open the combination puller/cutter's electrical enclosure.** Turn the disconnect dial on the door to the OFF or "O" position and open the door.
2. **Insert the main power wire** through the knockout in the side of the enclosure. Secure the wire with an appropriate strain relief.
3. **Connect the power wires** to the terminals indicated on the wiring diagram that came with your machine.
4. **Check every terminal screw** to make sure wires are secure. Gently tug each wire. If a wire is loose, use a screwdriver to tighten the terminal.
5. **Connect the ground wire** to the grounding point shown in the wiring diagram shipped with your unit.



Installing the Cutter Blades

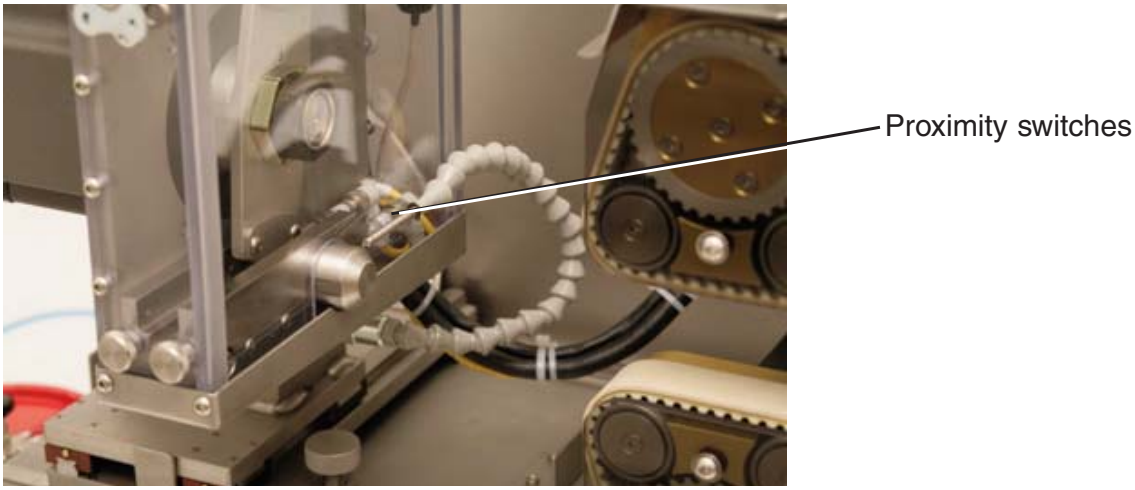
⚠ DANGER: Sharp Blades!

Most injuries caused by knife blades occur when the cutter has been turned off. Handle blades with care at all times.

- Always wear cut-resistant gloves when the cutting chamber is open and when handling blades.
- Always lock out power to the cutter before opening the cutting chamber.
- Always wait until the cutter head has completely stopped before opening the knife guard.

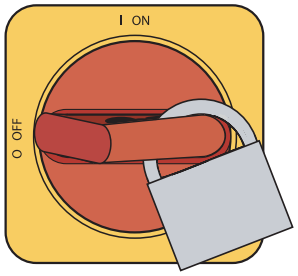
Combination puller/cutters are equipped with several safety devices to ensure safe operation. Never remove or disable these devices to sustain production. Operating without these devices can cause severe injury.

- When the knife guard is opened, the knife guard switch stops the cutter.
- Two proximity-type safety switches prevent operation unless the cutter bushings are in place.
- The cutter “Stop” button activates a circuit that stops the cutter head.



For on-demand cutting, mount the blade at the “on-demand” position stamped on the cutter head. *See the Appendix B, for more information about choosing the appropriate blade for your material.*

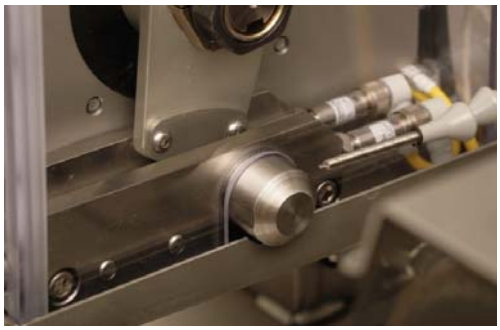
Mounting the Cutter Bushings



DANGER: Sharp blades
Always wear cut-resistant gloves when the cutting chamber is open and when handling blades. Never open cutting chamber without locking out the cutter power and waiting until the cutter head stops spinning.

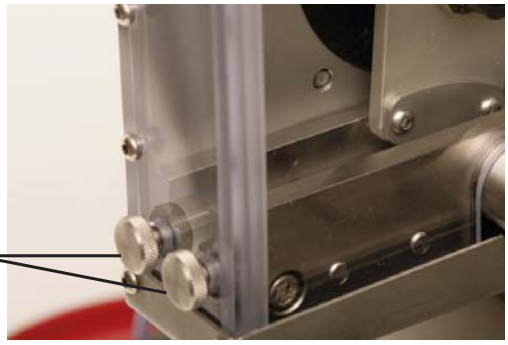
1 **Rotate the cutter head** until the blade is positioned in the gap between where the bushings are located.

2 **Slide the downstream bushing into position**, positioning it up to and barely touching the blade (using a feeler gauge). NOTE: the blade should not be deflected.



NOTE: For more information about setting and adjusting the gap for the bushings, *see Appendix C, About Cutter Bushings*

3 **Tighten the bushing retaining system** against the flat side of the bushing to hold the bushing in position.



(continued)

Mounting the Cutter Bushings

(continued)

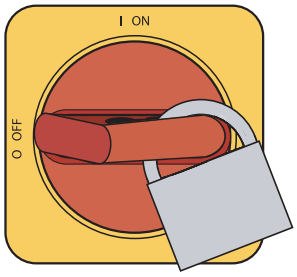
4 **Slide the upstream bushing into position,** positioning it up to and barely touching the blade (using a feeler gauge). NOTE: the blade should not be deflected.

5 **Tighten the bushing retaining system** against the flat side of the bushing to hold the bushing in position.

> ⚠ **DANGER: Sharp blades**
> Always wear cut-resistant gloves when the cutting chamber is open and when handling blades. Never open cutting chamber without locking out the cutter power and waiting until the cutter head stops spinning.

6 **Rotate the cutter head by hand** to make sure the bushings did not move, and that the blade still passes through the gap between the bushings.

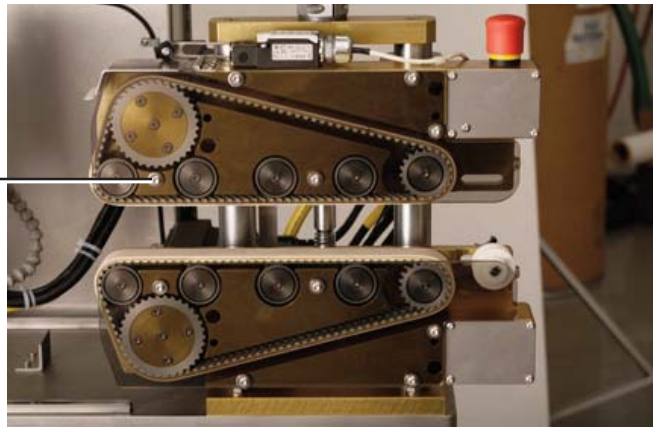
Adjusting Belt Tension
For Puller Model CPC 1-12



1 **Turn the main power disconnect to the off position.**

2 **Remove the upper and lower polycarbonate belt guards:**

- **Remove the screws** attaching guards to unit (five each: front).
- **Remove guards.**

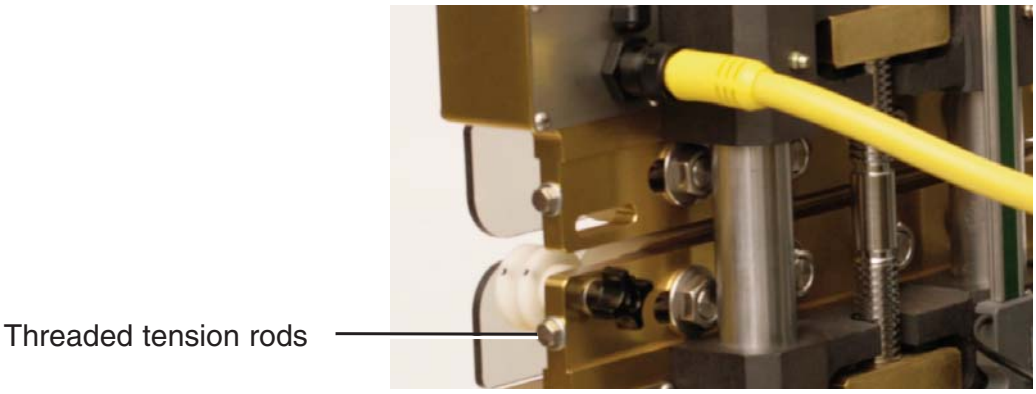


3 **Check belt tension.** Use a tension-measuring tool. Belts should be just tight enough to prevent slipping, and the gap between the upper and lower belts should be even across the width of the belt.

4 **Adjust belt tension, if necessary.**

✎ **NOTE:** Loose belts result in belt and product slippage; over-tightened belts result in distorted product and can lead to premature bearing failure.

Adjust tension by turning the threaded tension rods. Keep tension on front and back edges, the top and bottom belts should be as even as possible.



(continued)

Adjusting Belt Tension
For Puller Model CPC 1-12 (continued)

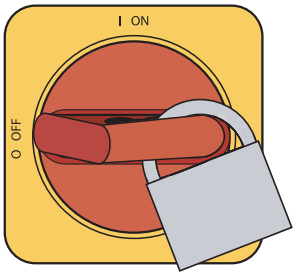
5 Fine tune tension:

- **Lower the belts** to a gap of about 1/8 inch (3 mm).
  See Installation Section entitled, Setting the Belt Gap.

- **From the upstream end of the belts**, look down the length of the belts at the gap between the belts. If the gap is not even, adjust the tension until the gap is even and measures 1/8 inch. The shape of the gap should not be concave (over-tightened) or convex (too loose).

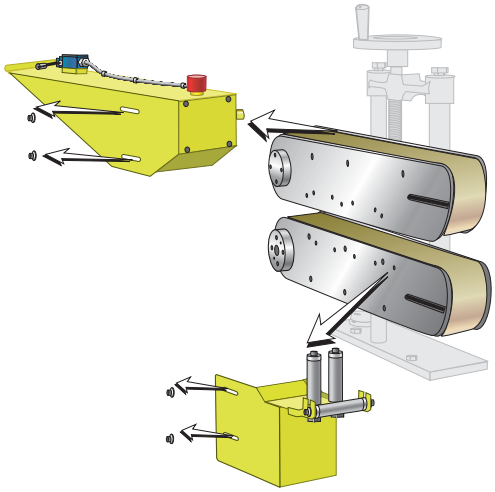
- **Check tension and re-adjust as necessary.**

For Puller Model CPC 3-20



1 Turn the main power disconnect to the off position.

2 Remove the belt guards. Remove the screws attaching guards to unit (four on each guard: top, bottom, front and rear). Disconnect the safety cable on the upper guard. Lift off and remove guard.



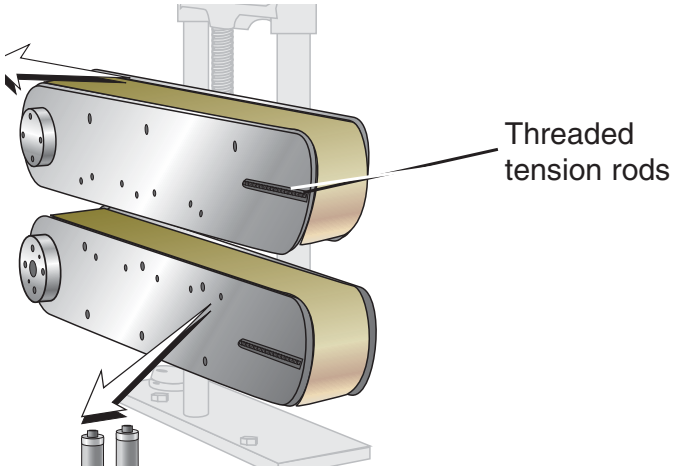
3 Check belt tension. Use a tension-measuring tool. Belts should be just tight enough to prevent slipping, and the gap between the upper and lower belts should be even across the width of the belt.

NOTE: Loose belts result in belt and product slippage; over-tightened belts result in distorted product and can lead to premature bearing failure.

(continued)

Adjusting Belt Tension
For Puller Model CPC 3-20 (continued)

4 **Adjust belt tension, if necessary.** Adjust tension by turning the threaded tension rods. Keep tension on front and back edges, top and bottom belts as even as possible.



5 **Fine-tune the tension:**

- **Lower the belts** to a gap of about 1/8 in. (3 mm).
  See Installation Section entitled, Setting the Belt Gap.

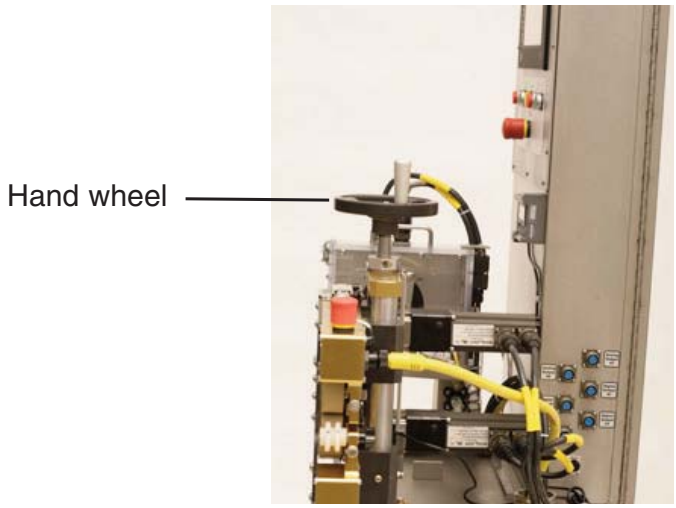
- **Check the appearance of the belt gap.** From the upstream end, look down the length of the belts. The shape of the gap should not be concave (over-tightened) or convex (too loose). Adjust the tension until the gap is even.

- **Check the tension and readjust as necessary.**

Setting the Belt Gap
For Puller Model CPC 1-12

The upper and lower belt boom assemblies are controlled by a common threaded rod. Turn the hand wheel to move the belts up and down. The belt gap should be set to the dimensions of the extruded product, being careful not to make the gap so small that the pressure causes distortion in the product.

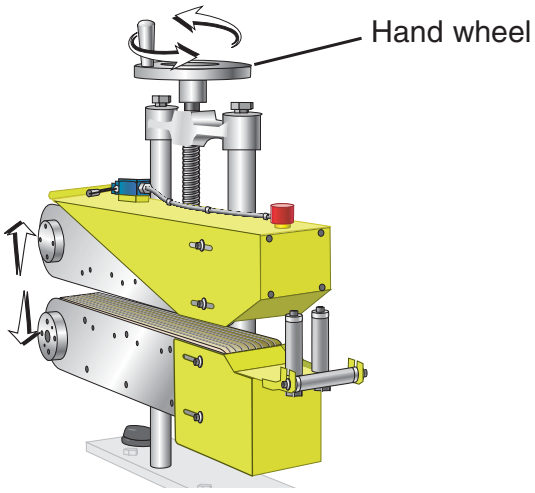
1 **Turn the hand wheel** until the gap between the belts reaches the desired distance.



For Puller Model CPC 3-20

The upper and lower belt boom assemblies are controlled by a common threaded rod. The upper and lower belts move away from each other or toward each other as the hand wheel is turned. The belt gap should be set to the dimensions of the extruded product, being careful not to make the gap so small that the pressure causes distortion in the product.

1 **Turn the hand wheel** until the gap between the belts reaches the desired distance.



Checking Repeatability

IMPORTANT: *See Operation Section entitled, Tuning the Cutter*, if using Red Lion HMI and Control Techniques/ Emerson Servo Drives

Before any Conair Medline Combination Puller/Cutters are shipped, they are tested for cut time repeatability to be sure they are within performance specifications. The repeatability test checks the performance of the rotary knife cutter to return to the home park position after a complete cut. Acceptable repeatability times allowed for each cutter model prior to shipping are:

Type of Cutter	Repeatability Time
CMSC Positional Servo	Less than 0.1 millisecond

✎ **NOTE:** 1-millisecond at 60 feet per minute is equal to .012 inches.

The repeatability mode is built into the Conair cutter controls and allows you to perform similar tests, without any external test equipment. It is recommended that you check repeatability on a regular basis. Acceleration/deceleration delays of the servo do not contribute to repeatability error; any error is attributed solely to motor stability, couplings, assembly, power, and proximity sensor alignment.
Use any blade speed and line speed. The line speed is only seen while in the Encoder or Product Modes. It is recommended that the tests be performed at cut intervals between 0.5 and 5-seconds. Do not change the blade speed or the line speed after starting the test.

To test repeatability:

1. **Turn on the cutter.** Perform the test in Encoder Mode with the cutter on-line. The Display will read: DevCP shows problems with the cutter. DevCC shows problems with the puller.
2. **Press the "Menu" key to display operator functions.**
3. **Press softkey "Test" to display DevCP screen.**
4. **Press softkey "On/Off" to start the testing and display the results.**
5. **Pressing "Next" key displays DevCC results.**

✎ **NOTE: "**Previous" key returns to DevCP screen.

Repeat the test by pressing the "Reset Cut" button to begin a new sample period. To end the Repeatability test, press softkey "On/Off" or "Exit".

Repeatability Test Results

Results in Flywheel Mode
The display shows DevCC a full revolution of the cutter head. The reading is in milliseconds, to the third decimal place, i.e. 0.010 is 0.01 milliseconds (or 10 microseconds). If the reading exceeds 0.200 there is a problem with the cutter drive. If this occurs the error is too large and there is a problem in the cutter drive that must be corrected.

IMPORTANT: *See Operation Section entitled, Tuning the Cutter*, if using Red Lion HMI and Control Techniques/ Emerson Servo Drives

Results in Timer Mode
When testing repeatability in Timer Mode, the cutter is making on-demand cuts at a set time interval (i.e. one-second intervals). The display shows the cut-to-part (CP) reading and the cut-to-cut (CC) reading. The reading is in milliseconds, to the third decimal place, i.e. 0.010 is 0.01 milliseconds (or 10 microseconds).

CP is the peak time variance between the cut signal output (preset time) to the servo amplifier, and the programmable limit switch just prior to the center of the bushing. This is the repeatability of the cutting system to accelerate through the part. This value is higher than the CC reading since it includes the acceleration and deceleration contributed by the servo motor.

CC is the peak time variance between cuts. Record and compare the cut-to-cut number to the CC value recorded in Encoder or Product Mode shows how much error is by external influences (i.e. variation in belt puller speed, encoder mounting problem, etc.).

If the reading exceeds 0.200, there is a problem with the cutter drive. If this occurs the error is too large and there is a definite problem that must be corrected.

Results in Product Mode
The display shows the cut-to-part (CP) reading and the cut-to-cut (CC) reading. The reading is in milliseconds, to the third decimal place, i.e. 0.010 is 0.01 milliseconds (or 10 microseconds).

Compare the cut-to-part (CP) reading to the CP reading in the other modes. There should be very little difference in these readings.

Compare the cut-to-cut (CC) reading to the CC reading in the other modes. Since the Product Mode is influenced by external signals, this reading will reflect the speed regulation of the puller.

Preparing for Testing

1. **Make sure all components** are installed according to assembly drawings. Make sure that all bolts have been checked for tightness.

2. **Check to ensure that the combination puller/cutter is firmly locked into position** with the anchoring screws.

3. **Check that all wiring conforms to electrical codes**, and all wiring covers are in place.

DANGER: Pinch Hazard!

Never remove or disable safety devices to sustain production. Operating without these devices could lead to hazardous conditions that can cause severe injury. Take all necessary precautions when working around moving parts to prevent body parts and clothing from being pulled into the machine.

Testing the Installation
Two-Line HMI Interface Operation

1 **Plug in the main power cord and turn on the main disconnect.** The display should fully illuminate and start up. Power on lights will illuminate.

2 **Check that the "Emergency Stop" buttons are in the out, extended position.**

✎ **NOTE:** If the "Emergency Stop" button is pushed in, there will be no power applied to the amplifier and the operator interface will display "starting commands" for an extended period of time.

3 **Make sure that the Cut On/Off switch is Off.** If necessary, press button to display off.

4 **Press "Start Puller" button.** The puller must be activated before the cutter portion can be turned on. Once the puller is running press the start button for the cutter section, the blade will begin to rotate.

✎ **NOTE:** For more information about setting and adjusting the gap for the bushings, *see Appendix C, About Cutter Bushings.*

5 **Open the knife guard.** The machine start push button should go out.

If the cutter is not working properly at any time, turn it off immediately and refer to the *Troubleshooting section* of this User Guide.

If you do not encounter any problems, proceed to the Operation section.

(continued)

Testing the Installation (continued)
Touchscreen HMI Interface Operation

1 **Plug in the main power cord and turn on the main disconnect.** The display should fully illuminate and start up. Power on lights will illuminate.

2 **Check that the "Emergency Stop" buttons are in the out, extended position.**

✎ **NOTE:** If the "Emergency Stop" button is pushed in, there will be no power applied to the amplifier and the operator interface will display "starting commands" for an extended period of time.

3 **Make sure that the Cut On/Off switch is Off.** If necessary, press button to display off.

4 **Press "Start Puller" button.** The puller must be activated before the cutter portion can be turned on. Once the puller is running press the "Start" button for the cutter section, the blade will begin to rotate.

✎ **NOTE:** For more information about setting and adjusting the gap for the bushings, *see Appendix C, About Cutter Bushings.*

5 **Open the knife guard.** The cutter will stop and the touchscreen on the Main Page will display "Stopped" above the cutter section of the control.

If the cutter is not working properly at any time, turn it off immediately and refer to the *Troubleshooting section* of this User Guide.

If you do not encounter any problems, proceed to the Operation section.

Operation

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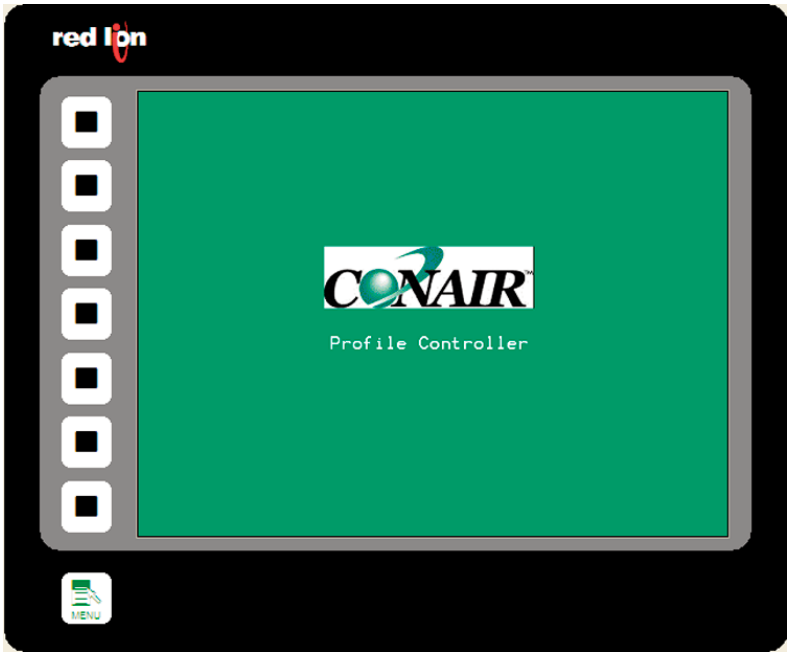
Conair Medline Combination Puller/Cutter - Touch Panel

The Conair Medline Combination Puller/Cutter uses a common Red Lion G310 color touchscreen operator interface. Touchscreens provide a user-friendly interface to the puller/cutter. Information can be shown while maintaining an easy-to-read and easy-to-use environment.

On the left-hand side of the panel are seven general-purpose buttons and a "Menu" button, these are not used in this application. Touchscreen buttons that are used appear on the screen. In many cases the appearance of text on the switches will change to show its state (e.g. on or off).

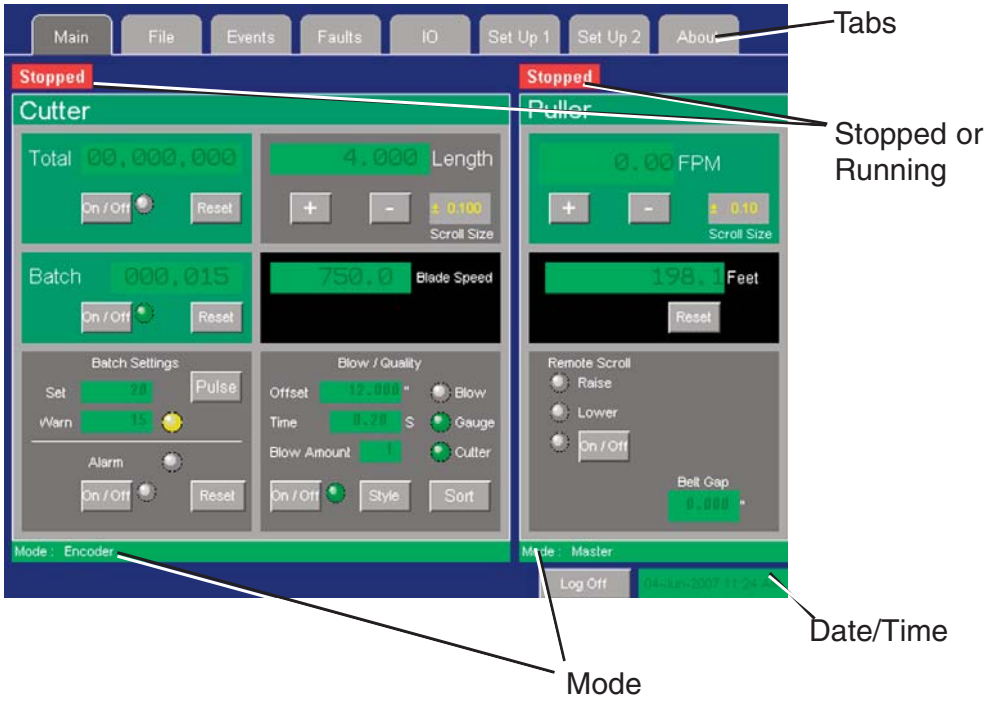
At power-up the Flash Page appears briefly followed by the Main Page.



Using the Main Page

The Main Page appearance is affected by the modes that have been selected for the Medline Combination Puller/Cutter.

In the Main Page example, the puller is set to Master Mode and the cutter is set to Encoder Mode. The chosen mode appears at the bottom of each control section.

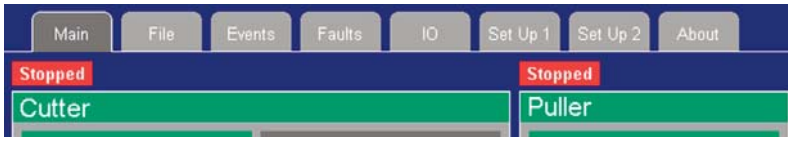


(continued)

Using the Main Page (continued)

Using Folder Tabs

A series of folder tabs appear at the top of every page. Each folder contains a page containing further parameters, selections or more folders. Tabs act as a simplified menu to move between pages. The last tab pressed opens the folder to show the page(s) contained inside. Highlighted tabs appear darker in shade compared to unselected tabs. In the example below, the "Main" tab has been selected.



Sample of a single-tiered tab page.

To select a specific tab:

1 Press the desired tab to access additional puller/cutter parameters.

✎ **NOTE:** Tab pages selected will remain on the puller/cutter's display screen until a new tab is selected.

Sample of a double-tiered tab page.

To select a specific sub-tab:

1 Press the desired main tab to access additional puller/cutter parameters.
(Set Up 1 and Set Up 2 tabs have double-tiered tab folders)

2 Select the desired sub-tab within the main tab page.

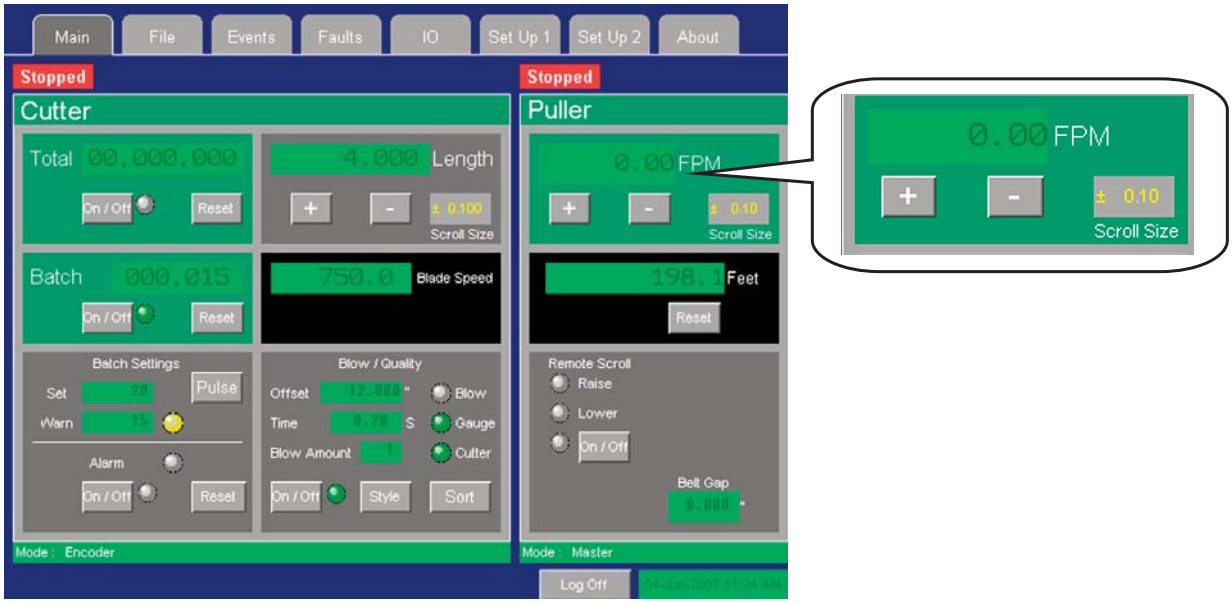
✎ **NOTE:** Tab pages selected will remain on the puller/cutter's display screen until a new tab is selected.

Using the Puller Control

For right-to-left configurations the cutter control is shown on the left with the puller control on the right, as in the example. Images of the controls may be switched at the factory for left-to-right combinations.

A message appears above each control to show if the drive is running or stopped. "Running" is shown as white text on a green background and "Stopped" is shown as white text on a red background. The cutter cannot run alone - it is interlocked with the puller, meaning that the puller must be running before the cutter can run. Likewise, if the puller is stopped the cutter will stop.

Setting the Puller Speed



Speed Control

The Main Page is used to view and set speed. Speed may be changed by using the (+) and (-) buttons that are just below the speed readout (Scroll Method) or they may be keyed in using a pop-up keyboard (Keyboard Method).

IMPORTANT: For Profile/Bubble/Taper products speed is controlled by a different program, it cannot be changed here.

(continued)

Using the Puller Control

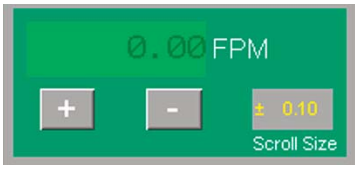
Setting the Puller Speed (continued)

Scroll Method

The (+) and (-) buttons can be used to add or subtract the value shown in the Scroll Size window to the current speed setting. Scroll Size is a user preference value. Four presets are available but only one may be selected at any given time. In the example, the chosen Scroll Size is set to ±0.10 FPM.

To enter a new puller speed:

1 **Press either the (+) or (-) scroll button to increase or decrease the set speed.** For example, 40 FPM becomes 40.10 FPM after pressing (+) once. The (-) button will subtract 0.10 FPM from the current set speed - example 40 FPM becomes 39.90 FPM after pressing (-) once.



Typically, the operator will choose four values from fine to coarse that would be used for control of the line. An example is 0.01, 0.10, 1.00 and 5.00 FPM. Pressing the Scroll Size window will toggle through the four preset increments.

NOTE: To set new scroll increments, *see Operation Section entitled, Scroll Page Description.*

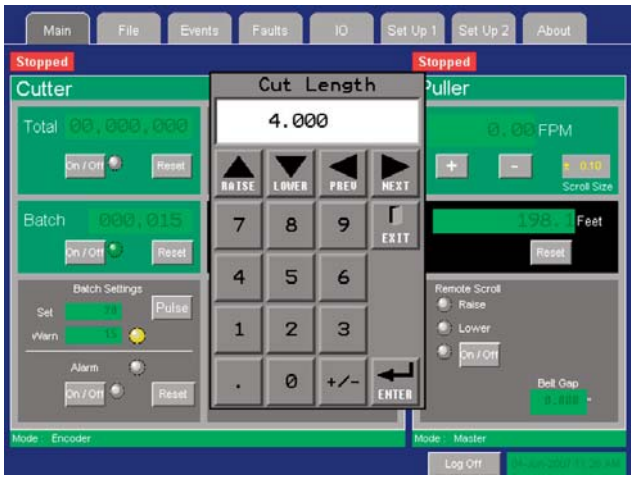
Keyboard Method

To enter a new puller speed:

1 **Press the window showing the puller speed.** A pop-up keyboard appears.

2 **Enter in your new value on the pop-up key pad.**

3 **Press the "Enter" button to lock in the new puller speed.** The pop-up key board is removed.

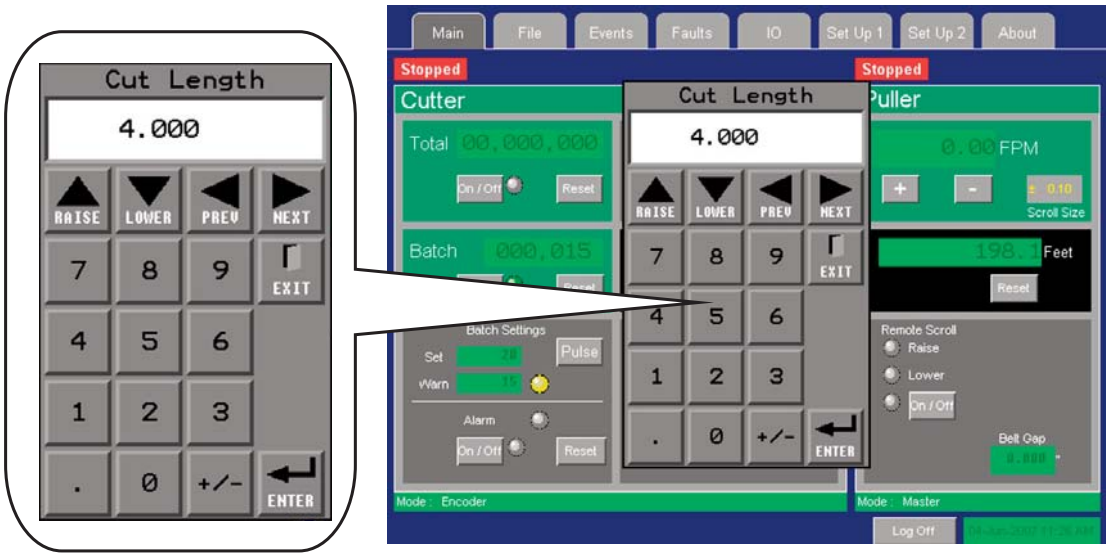


NOTE: In this example, cut length is being altered. The procedure to change any measurement using the Keyboard method is exactly the same.

(continued)

Using the Puller Control

Setting the Puller Speed (continued)



NOTE: In this example, cut length is being altered. The procedure to change any measurement using the Keyboard method is exactly the same.

A title appears at the top of the pop-up keyboard to confirm which preset is being modified. *See Operation Section entitled, Using the Cutter Control, Setting the Cut Length*. The explanation given in that section applies to changing any preset.

- If the pop-up is accessed by mistake press "Exit" to remove it. Also, if an incorrect value is entered press "Exit" to retain previous value.

- **"Raise" and "Lower"** buttons will add or subtract one least significant digit, i.e. for two decimal places the value will change by 0.01, for three decimal places the value will change by 0.001.

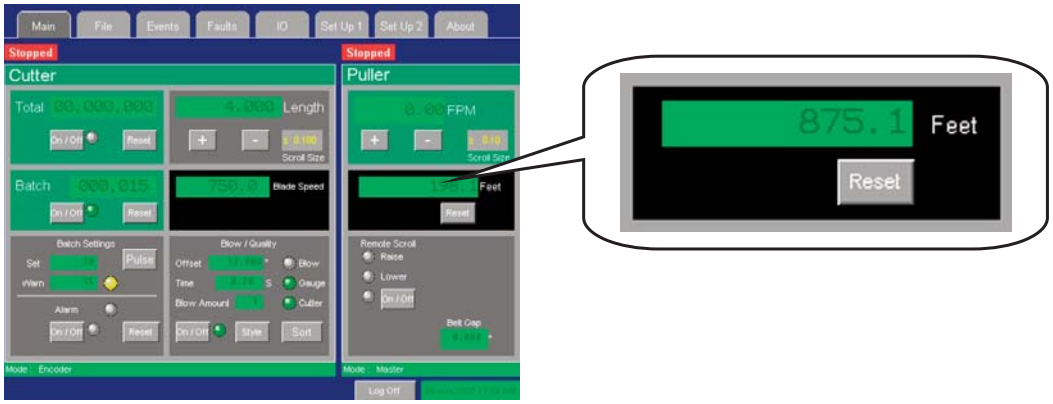
- **"Prev" and "Next"** buttons are used to go to the next preset on the page. If there is only one preset on the page the preset will remain selected.

- The **(+/-)** key should not be used - all values are positive. All presets are range checked, a negative value will be ignored.

All numeric presets use the same style numeric keyboard. A computer style keyboard appears for text presets, i.e. user or filename entry.

Using the Puller Control (continued)

Using Footage

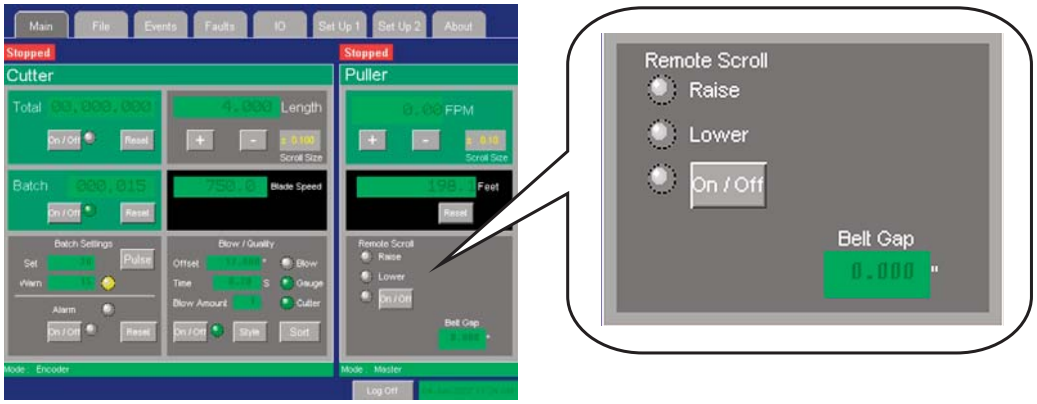


The middle section of the puller control displays footage. Footage can be reset at the beginning of a production run and can be used to record the amount of material produced.

To reset the footage counter:

1 Press the "Reset" button to "zero" the counter.

Using Remote Scrolling



The speed of the puller can be changed by remote control. For example, an automated diameter gauge could alter the puller speed in order to maintain diameter. Raise and Lower inputs are available for remote operation. A simple three-wire integration is required. LEDs show the input condition at the Raise and Lower terminals. Green means the input is active, Gray means the input is off.

Remote Scroll amount is a user preference. *See Operation Section entitled, Scroll Page Description.*

The "On/Off" button is used to enable or disable the remote. The light next to this button illuminates when Remote Scroll is on.

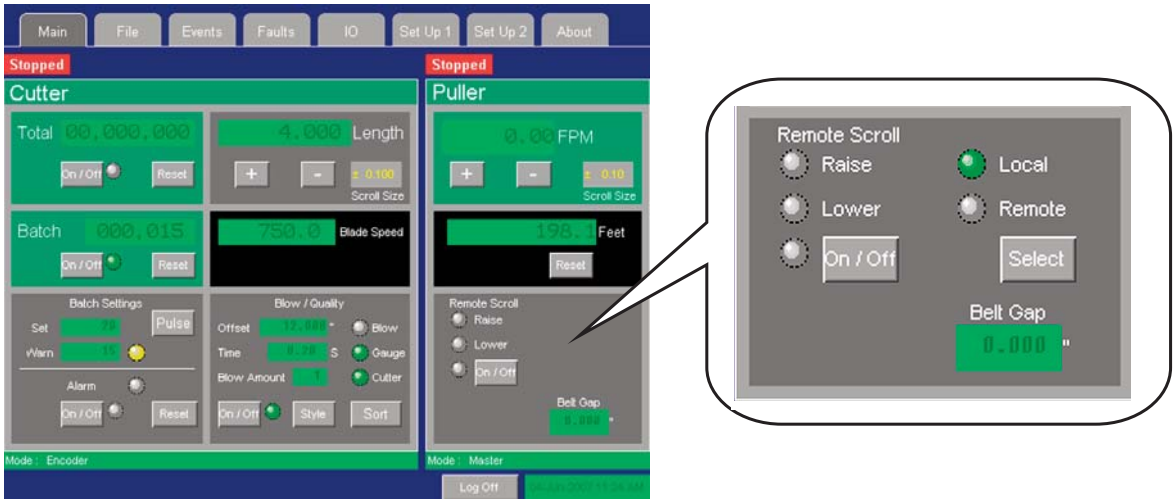
NOTE: If the remote gauge is fitted with a manual and automatic selector then the remote option at the puller can be permanently enabled.

Using the Puller Control (continued)

Switched (Local/Remote) Modes

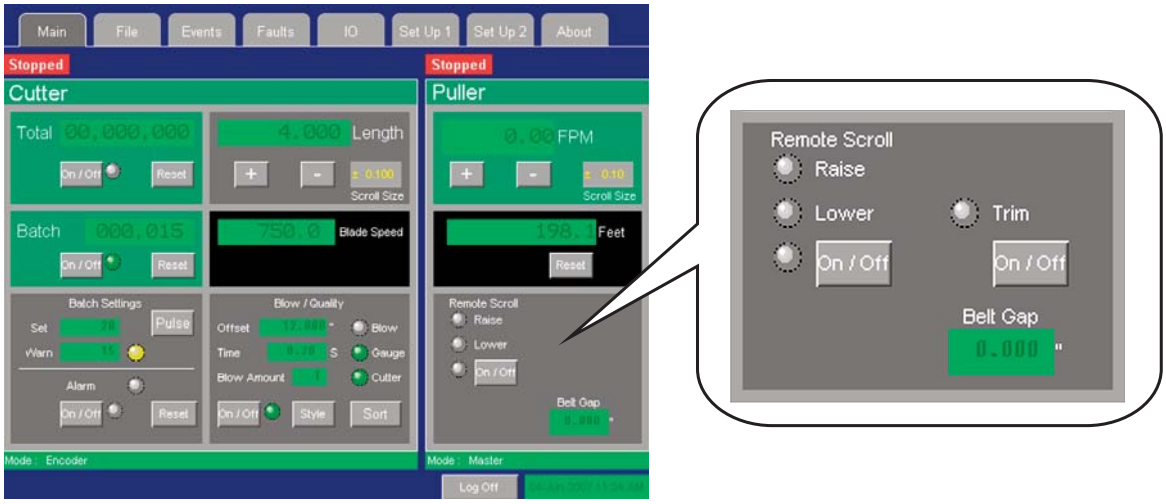
This section will have additional buttons and indicators for Switched or Trim Modes. Extra mode related items appear at the right.

Switched modes include a Local/Remote "Select" button and indicators. The state of Local or Remote is provided as an output at the puller drive (Module Output 3). *Remote = On, Local = Off.*



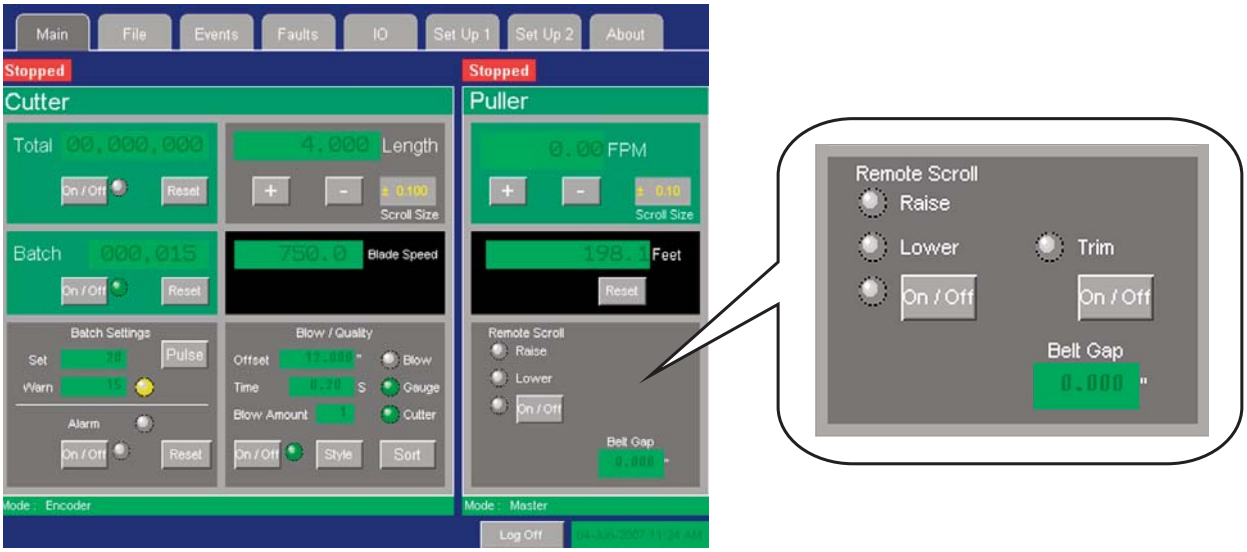
Analog Trim Modes

Analog Trim modes will have a Trim "On/Off" button and indicator. Puller speed can be modified by the analog input when enabled.



Storing the Belt Gap

The belt gap dimension can be stored here. The value should be read from the belt gap gauge and entered at this window. When returning to a product that was previously produced the user can recall the recipe value by viewing the saved file and then setting the belt gap to match. *See Operation Section entitled, Using Files Pages, File Pages.*



To set the belt gap from the digital readout:

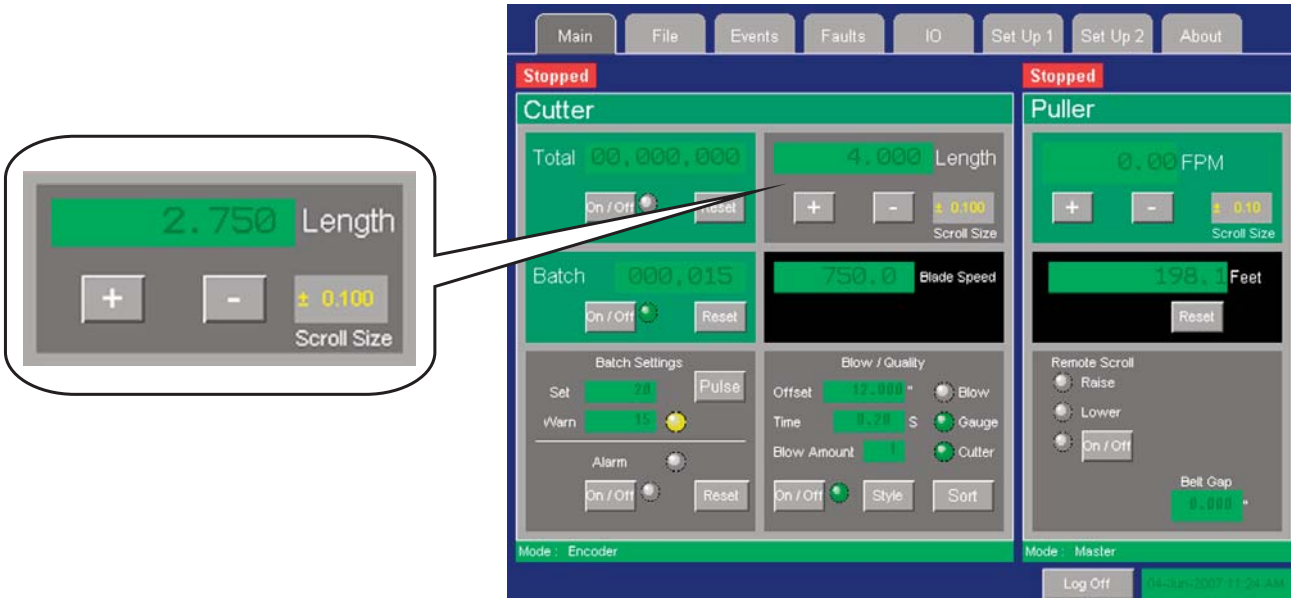
1. **View the belt gap measurement from the digital readout located on the Medline Combination Puller/Cutter's cabinet.**
2. **Press the window showing the puller belt gap.** A pop-up keyboard appears.
3. **Enter in your new value on the pop-up key pad.**
4. **Press the "Enter" button to lock in the new puller belt gap.** The pop-up key board is removed.

To set the belt gap from the file recipe:

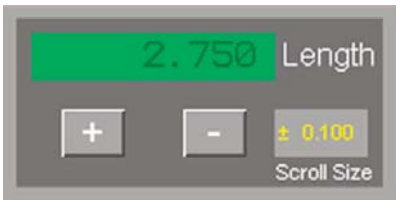
1. **Open the file page that contains the desired product recipe.**
2. **Locate the belt gap distance within the save file page.**
3. **Match the digital belt gap readout on the puller/cutter's cabinet to the amount from the saved file page recipe** using the manual hand wheel located on the puller.
4. **Enter the belt gap measurement in the Belt Gap window, by following the following the "Setting the belt gap from the digital readout" steps.**

Using the Cutter Control
Length

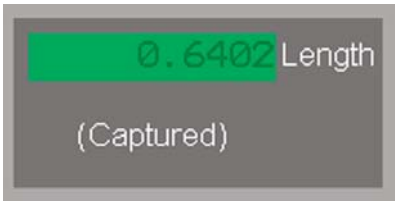
The cutter portion has multiple sections. These are grouped into categories.



- Total Counter
- Batch Counter
- Batch Settings
- Cut Length
- Blade Speed
- Blow Settings



Sample - Encoder Mode



Sample - Flywheel Mode

Features differ between the various modes. For example, the length in Encoder Mode can be set by the operator whereas Flywheel Mode (blade spins continuously) can only show length as a captured value. Captured value is the amount of material that has passed during each blade rotation, the blade arriving at the cutter bushing provides the capture. Cut Length can be changed using either the Scroll or Keyboard Methods in Encoder and Time Modes only. *See Operation Section entitled, Using the Cutter Control, Setting the Cutter Length, Scroll Method and Keyboard Methods.*

Using the Cutter Control

Length (continued)

Timer and Product Modes display a time value instead of a length. Time is measured in seconds to three decimal places.

Sample - Time Mode

Length can be changed using the (+) and (-) buttons that are just below the length readout or it may be keyed in using the pop-up keyboard. The time is shown in seconds. *See Operation Section entitled, Using the Cutter Control, Setting the Cutter Length, Scroll Method and Keyboard Methods*

Setting the Cut Length

Scroll Method

1 **Press either the (+) or (-) scroll button to increase or decrease the cut length.** Scroll Size is a user preference value. Two settings are available and are set in Set Up 1 - Scroll section. To alternate between the two Scroll Sizes, press the Scroll Size window. The default values are ±0.010" and ±0.100". *See Scroll Page Description for procedures to change Scroll Size settings.*

Using the Cutter Control

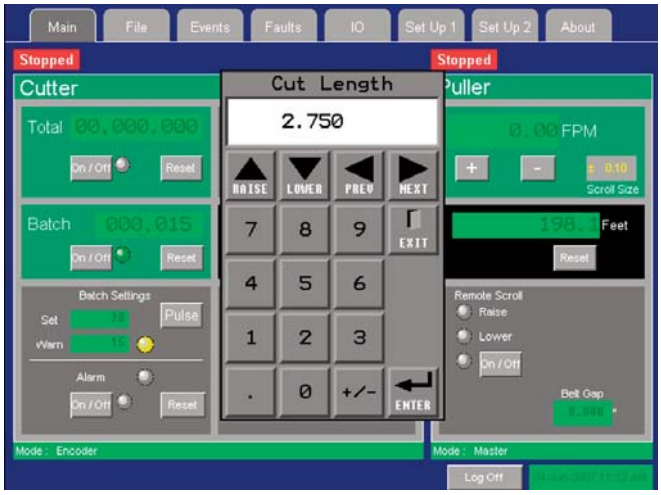
Setting the Cut Length (continued)

Keyboard Method

To change length using the keyboard method, press the Length window. A pop-up keyboard will appear. The new length can then be keyed in.

All numeric presets are altered using this method. An example of how to change the length is provided to help describe the key sequence. In this example, Length is 2.750" and will be changed to 6.000".

1 **Press the length window.** A numeric pop-up keyboard appears.

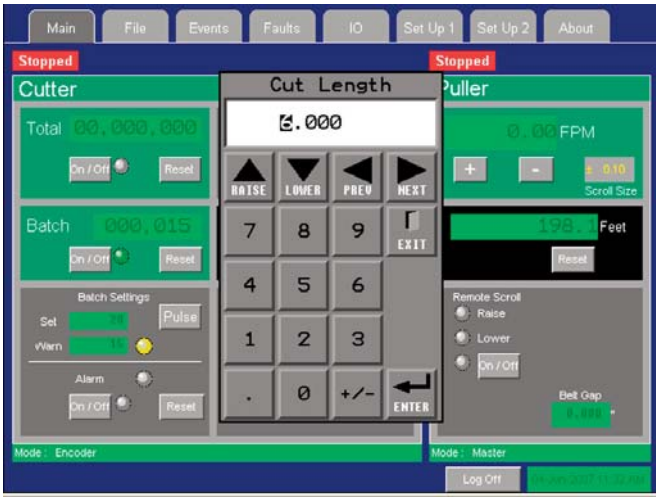


(continued)

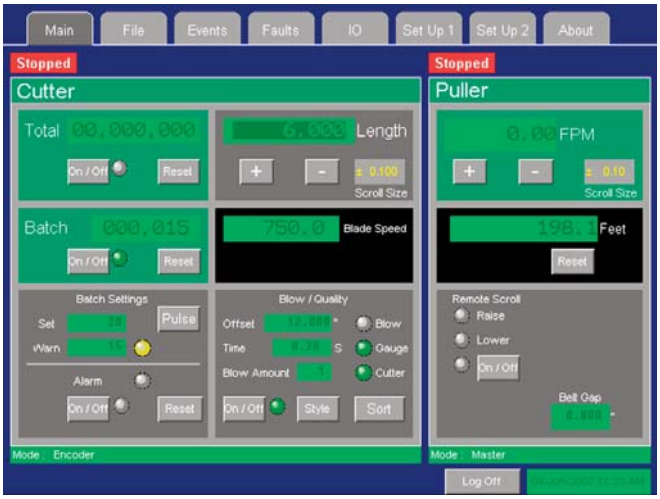
Using the Cutter Control
Setting the Cut Length

Keyboard Method (continued)

2 For 6.000" key in the new length as shown.



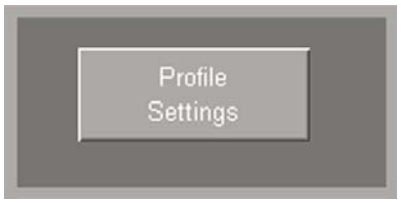
3 Then press "Enter". (The pop-up keyboard is removed).

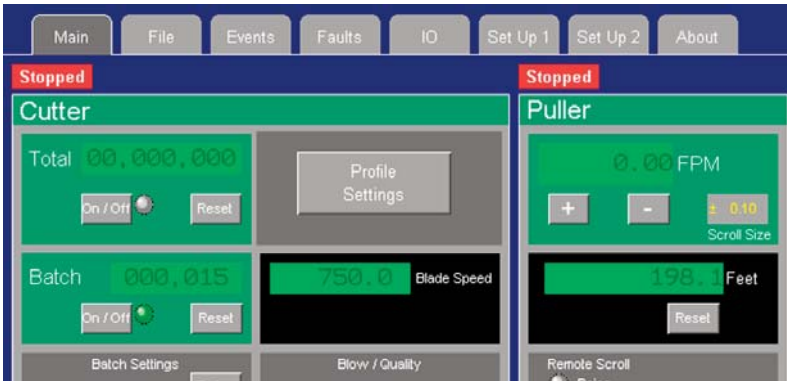


4 The new length is now in the Cut Length window.

Using the Cutter Control
Using Encoder Sequence, Cuff and Profile/Bubble/Taper Modes

Encoder Sequence, Cuff and Profile/Bubble/Taper Modes have many length presets. There are too many to be able to show on the Main Page. The length section on the Main Page for these modes is replaced by a button that is used to go to a secondary page that contains the extra presets.

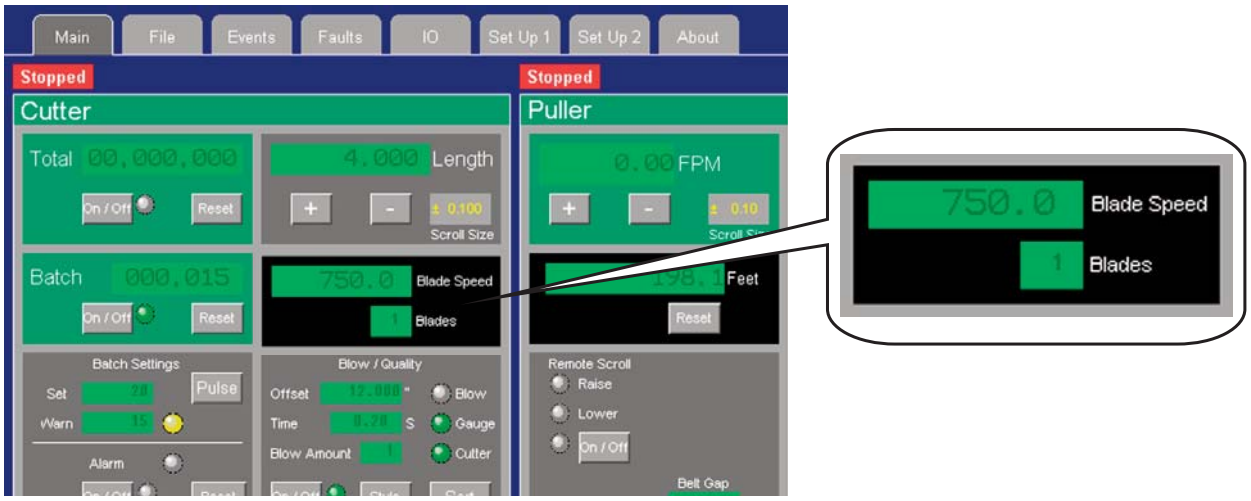




Sample of the Main Page with Profile/Bubble/Taper Mode selected.

✎ **NOTE:** Above is the button that is shown is for Profile/Bubble/Taper Mode. Encoder Sequence Mode has a button labeled "Sequence Settings" and Cuff Mode has a button labeled "Cuff Settings". *See Operation Section entitled, Mode Page Description and Profile/Bubble/Taper Page Description, Encoder Sequence Page Description and Cuff Page Description.*

Setting the Blade Speed



Sample - Flywheel Mode showing Blades preset (for multiple blades)

Blade Speed shows the RPM of the blade. In some modes it is possible to set the Blade Speed. In other modes Blade Speed may be viewed only. Press this window to access the Blade Speed preset.

NOTE: Blade Speed adjustment is an option, on some cutters Blade Speed will be fixed.

To adjust the blade speed:

1 **Press the Blade Speed window.** A numeric pop-up keyboard appears.

2 **Key in the new blade speed.**

3 **Then press "Enter".** The pop-up keyboard is removed.

4 **The new blade speed is now in the Blade Speed window.**

Using Multiple Blades

Multiple blades may be entered and fitted for Flywheel and Follower modes only. An additional preset will appear in Blade Speed section for entering the amount of blades. Also, a circular or balanced arm style blade holder will be fitted for the extra positions. Blade Speed will then appear as Cuts per Minute (CPM) instead of RPM.

CPM = Blade Speed x Number of Blades.

Blade options for Follower and Flywheel Modes.

Blades	Angle
1	360
2	180
3	120
4	90
5	72
6	60
7	No Option
8	45
9	40
10	36
11	No Option
12	30

To adjust the number of blades:

1 **Press the Blades window.** A numeric pop-up keyboard appears.

2 **Key in the amount of blades that are being used.**

3 **Then press "Enter".** The pop-up keyboard is removed.

4 **The new blade amount will appear in the Blades window.**

Using 180 Degree Cutting (Optional)

An option is available for use with the Encoder Mode where 2 blades may be fitted to the blade arm. The cut then makes 180-degree on-demand indexes (half a revolution). 180 and 360-degree buttons are provided when this option has been added.

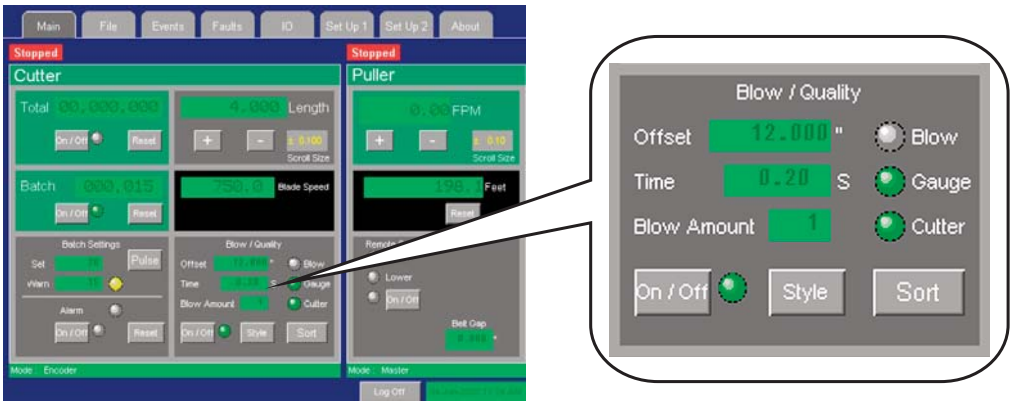
Configuring the Blow Off Settings

(Optional)

A dedicated output is available for use with a Blow Off/Take Off Conveyor. This output is intended to operate a valve to blow good pieces from the Take Off Conveyor after they have been cut.

Offset

An offset preset length is available that acts as a delay from the cut. Distance information is provided by the puller - not the Take Off/Blow Off Conveyor. There is no distance information feedback available from the conveyor. In most instances, the conveyor is set to travel faster than the puller in order to create piece separation. This speed relationship will need to be factored in when setting the Offset amount.



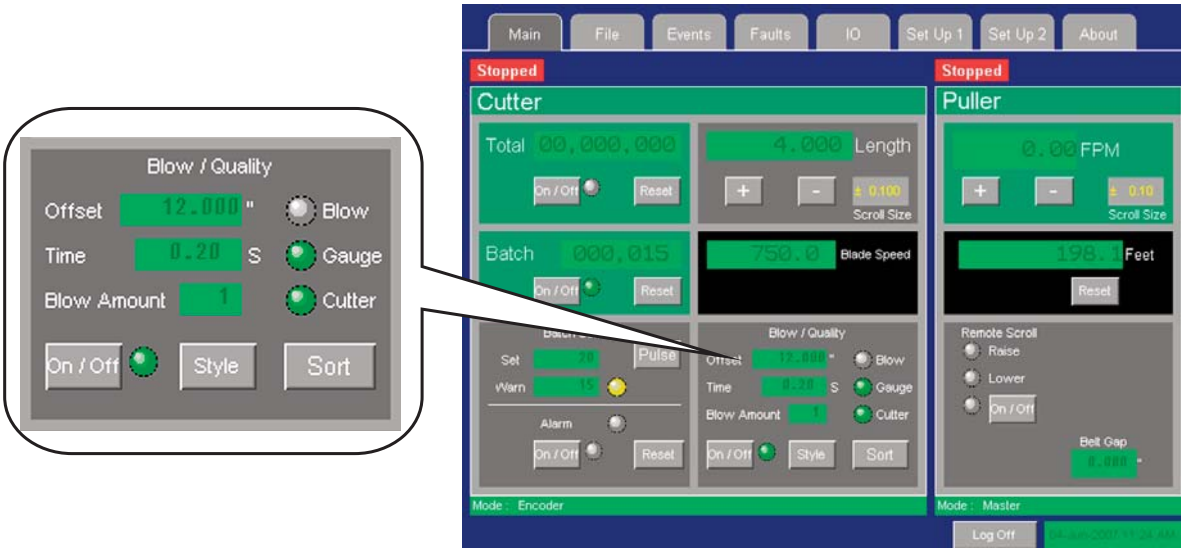
To adjust Offset amount:

1. **Press the Offset window.** A numeric pop-up keyboard appears.
2. **Key in the new amount of offset amount,** taking into account the Take Off/Blow Off Conveyor's speed and the puller speed**.**
3. **Then press "Enter".** The pop-up keyboard is removed.
4. **The new offset amount will appear in the Offset window.**

Configuring the Blow Off Settings

(Optional) (continued)

Time



Time is the on-time duration for the air valve(s) of the Take Off/Blow Off Conveyor. The time needed to eject the product should be kept short to avoid exhausting accumulated air. The status of the air valve(s) will show in the Blow/Quality section. An indicator light that is next the the word “Blow” will illuminate when the valve(s) is on.

To set the Time amount of the Take Off/Blow Off Conveyor’s air valve(s):

1 **Press the Time window.** A numeric pop-up keyboard appears.

2 **Key in the new time amount, which is measured in seconds to two decimal places.**

3 **Then press “Enter”.** The pop-up keyboard is removed.

4 **The new time amount will appear in the Time window and will then be active.**

Configuring the Blow Off Settings

(continued) (Optional)

Blow Amount

Blow Amount is available to blow one or many pieces off the Take Off/Blow Off Conveyor at once. For example, if the Blow Amount is set to 5 the Blow Off valve(s) on the conveyor will blow once after 5 pieces have been cut.

To change the Blow Amount setting:

1 **Press the Blow Amount window.** A numeric pop-up keyboard appears.

2 **Key in the new blow amount.**

3 **Then press "Enter".** The pop-up keyboard is removed.

4 **The new blow amount will appear in the Blow Amount window and will then be active.**

Blow Activation

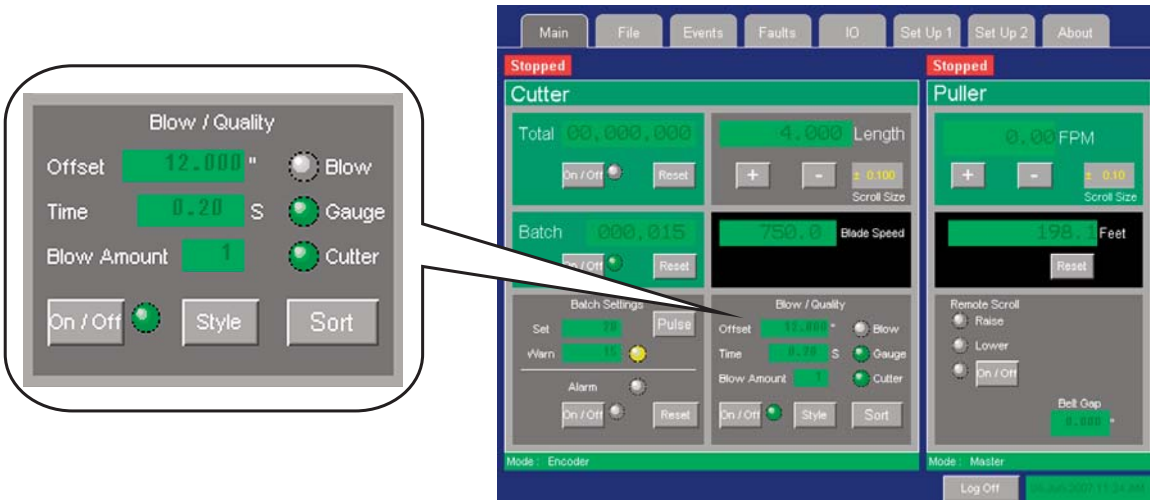
On/Off is used to enable or disable the Blow Off settings.

1 **Press the "On/Off" button to toggle the Blow feature on and off.** An indicator light next the the "On/Off" button will illuminate when the Blow feature is activated.

Configuring the Blow Off Settings

(continued) (Optional)

Style



Pressing the “Style” button will toggle through three different Blow Settings. Blow Amount as shown in the example above is one of the options. Other options are "Blow always when Good", or "Blow always when Bad”.

IMPORTANT: The options “Blow always when Good” and “Blow always when Bad” can expend a lot of air. Their settings should be kept low or not used when possible.

- **“Blow always when Good”** - the Take Off/Blow Off Conveyor’s air will remain energized (blowing) while the product is good, allowing product to be diverted sideways off the conveyor. When the product is bad the valve will turn off so the product will fall off the conveyor into a receptical. The Offset value is used to delay the valve on or off times.

- **“Blow always when Bad”** - the Take Off/Blow Off Conveyor’s air will remain energized (blowing) while the product is bad, allowing product to be diverted sideways off the conveyor. When the product is good the valve will turn off so the product will fall off the conveyor into a receptical. The Offset value is used to delay the valve on or off times.

The quality input (good or bad) is used to control the air valve(s). No matter which option is selected the air valve will always be off when the cutter is stopped. *See Operation Section entitled, Quality Page Description.*

Quality - Good and Bad Indicators

- **Gauge (Product Quality) Indicator** - displays the quality of the product at the gauge. It will illuminate green if the product is good and red if the product is bad.

- **Cutter (Product Quality) Indicator** - displays the quality of the product at the cutter. It will illuminate green if the product is good and red if the product is bad.

Configuring the Blow Off Settings

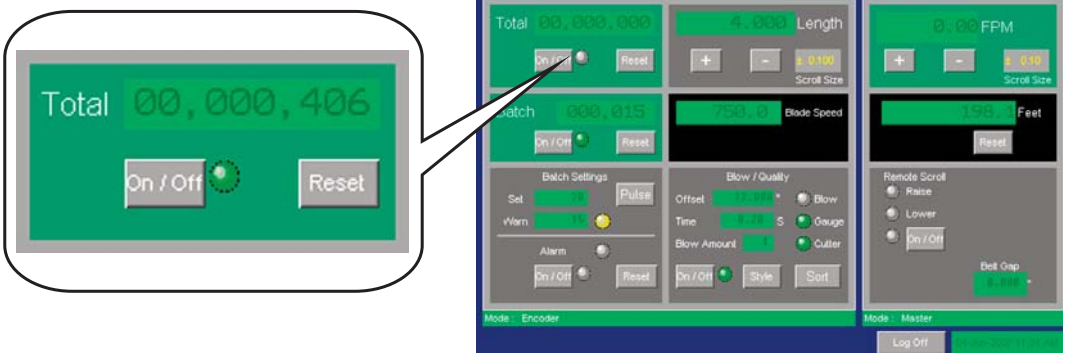
(continued) (Optional)

Scrap/Sort

The "Scrap/Sort" toggle button provides the option to force product to be scrapped (even if it is good) or be sorted into good and bad by using the Quality Sort feature. *See Operation Section entitled, Quality Page Description.*

Using the Total and Batch Counter

Total Counter



An 8-digit Total Counter is provided with reset and on/off capabilities. Typically, Total is used to display a count of all the pieces that were produced in a run. When used with the Quality Sort feature, only good pieces are counted.

To activate the Total Counter:

1 **Press the "On/Off" button to toggle the Total Counter feature on and off.**
When the Total Counter is on, an indicator light will illuminate.

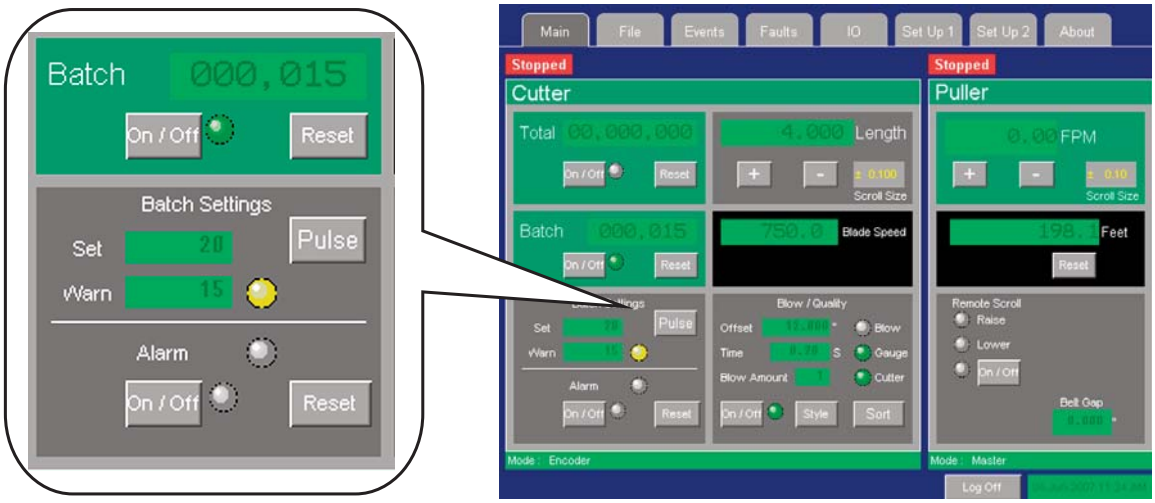
To reset the Total Counter:

1 **Press the "Reset " button.**

Using the Total and Batch Counter

(Optional) (continued)

Batch Counter



The Batch Counter is a 6-digit readout display and is used with the Batch Settings section that is located directly beneath the Total Counter. When used with the Quality Sort feature only good pieces will be counted.

To activate the Batch Counter:

1 **Press the "On/Off" button to toggle the Batch Counter feature on and off.** When the Batch Counter is on, an indicator light will illuminate.

To reset the Batch Counter:

1 **Press the "Reset " button.**

Configuring the Batch Settings

(Optional)

Set

The Set preset is used to set the number of pieces that will make up a batch. An output will operate upon batch completion. This output has a fixed pulse width (1/10th second) or a latch-on option.

Configuring the Batch Settings

(Optional)

Set (continued)

To enter a Set amount:

1 Press the Set window. A numeric pop-up keyboard appears.

2 Key in the new set amount.

3 Then press "Enter". The pop-up keyboard is removed.

4 The new set amount will appear in the Set window and will then be active.

Warn

The Warn preset is set to a value less than the Batch setpoint. This level activates an operator warning that signifies a batch is near to completion. A yellow Warn light is shown on the touch panel when the count is between Warn and Set values. In addition, an output is available that can be used to operate an alarm (or tower light). In this example, Warn is off during counts 0 to 14, it activates at count 15 and deactivates at 20 (count resets to zero, Warn alarm automatically clears). If the Warn preset is higher than the Set amount it will be disabled.

To set the Warn amount:

1 Press the Warn window. A numeric pop-up keyboard appears.

2 Key in the new warn amount.

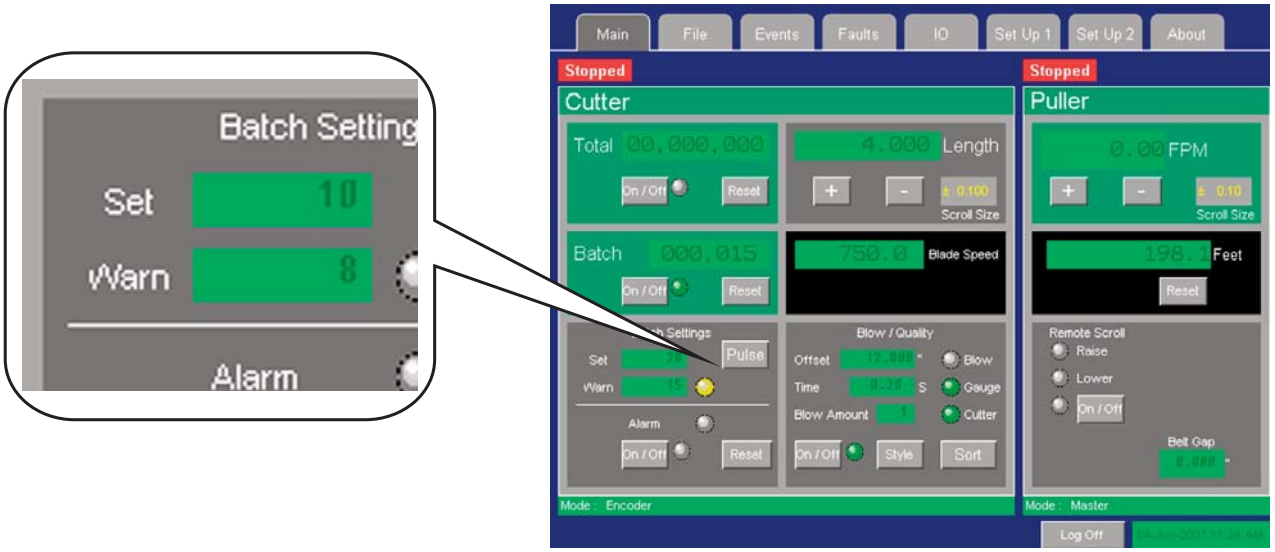
3 Then press "Enter". The pop-up keyboard is removed.

4 The new warn amount will appear in the Warn window and will then be active.

Configuring the Batch Settings

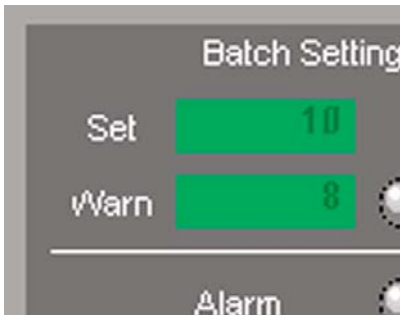
(continued) (Optional)

Pulse/Latch



The “Pulse/Latch” button option offers the choice of making the output pulse or latch on (stay on). The Latch option turns on the output, which will stay on until the “Reset” button is pressed. The Pulse option will only pulse the output, which will not require the “Reset” button to be pressed. In the Latch Mode there is an extra light that is shown on the touch panel to show the state of the Batch Complete output. The Warn output is automatically cleared when the Batch is complete.

Pressing the “Pulse/Latch” button will toggle between the Latch and Pulse functions.



Alarm

The alarm function is used as a local alarm only. If a physical Batch Alarm output is required the Warn or Latch options with outputs at the drive should be used. A yellow batch complete light is shown as the Batch count reaches the Batch setpoint. The alarm feature has to be enabled in order to operate. “Reset” is then used to clear the alarm. Pressing

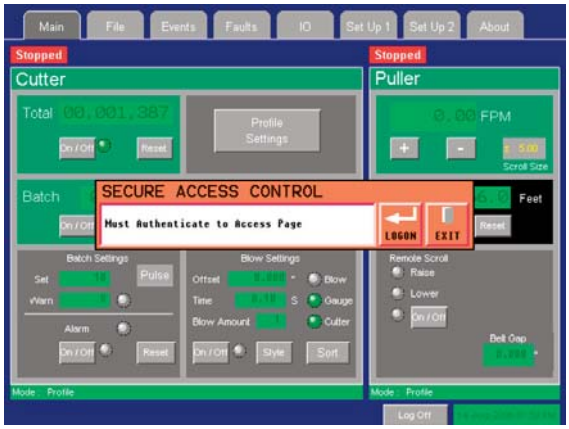
“Reset” also clears a Latched Batch output.

Accessing Secured Pages and Presets

Some pages and presets require a user name and password for access. Only when the user has successfully signed in will the protected page be displayed or a changed in the preset be finalized.

In the following example the operator has pressed a tab requiring the user to sign in (logon). A message appears - **Secure Access Control - Must Authenticate to Access Page**.

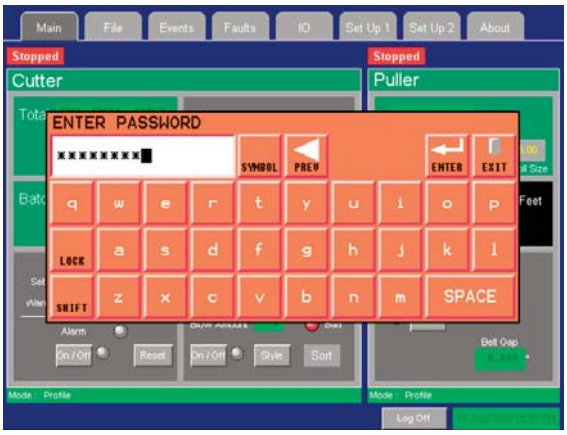
To access the password protected screens:



1 **Press the Logon button to access an area to enter the user name.** For maintenance personnel. enter **"Maint"** for the user name, followed by the **"Enter"** button.

(continued)

Accessing Secured Pages and Presets (continued)

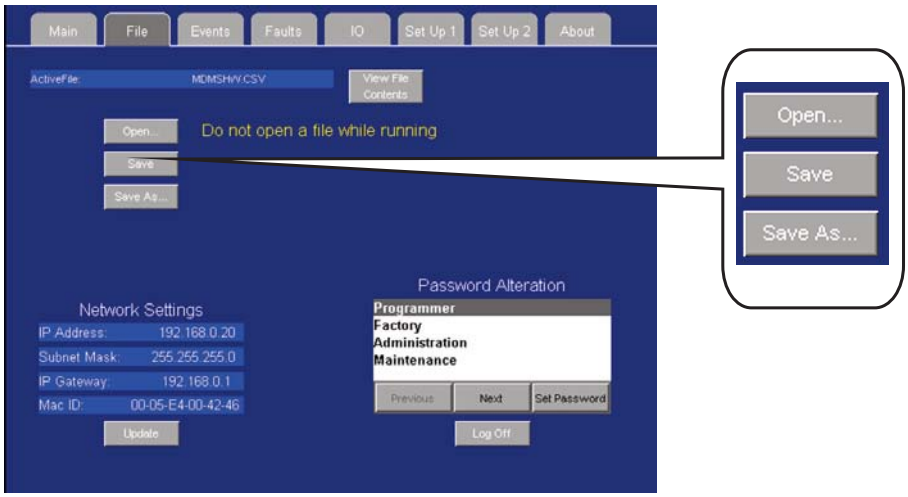


2 **A second keyboard appears for password entry.** Enter in the user password **"PASSWORD"** followed by the **"Enter"** key.

NOTE: The password is a user preference, *see Operation Section entitled, Changing the Password* to create a new password.

NOTE: The password characters do not appear as they are typed. An asterisk character appears for each key press.

Using File Pages



The File Page screen has three sections. One section is used for creating, saving and reopening files. Another section is for Ethernet. The remaining section is for password creation and alteration.

To access the File Pages:

1 Press the File tab located at the top of the display screen.

The filing system has a similar feel to any PC based software. Files may be created and recalled. The 8,3 DOS style of word naming is used (8 character filename with a 3 character extension). Extensions are fixed to .CSV (comma separated file). This is a format that can be opened using Excel or any text based word processing software. A comma is used to separate each parameter and parameter name.

A file may be created or saved at any time. However, files cannot be opened while the machine is running. A warning message to this effect is given on the File Page and again if an attempt to open a file is made.

NOTE: The filing system is used only with the Profile/Bubble/Taper mode.

Ethernet provides ability to upload and download files to computers sharing an office network.

To access the Medline's touch panel web server:

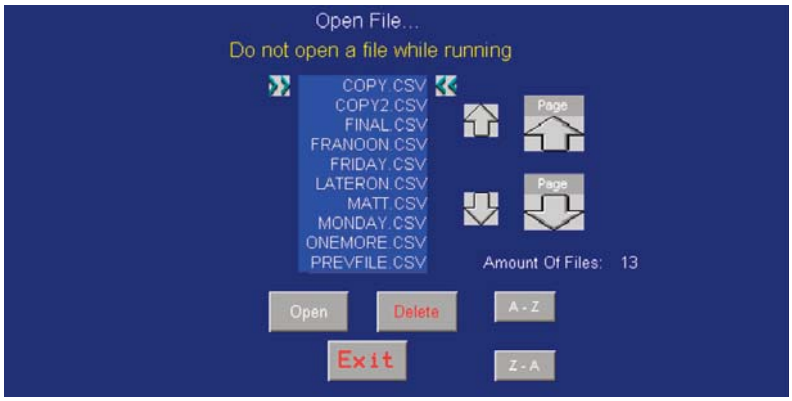
1 Type in the Medline's touch panel web server IP address as shown in the File Page sample above in the address bar of Internet Explorer. Be sure to add http:// before the IP address. (http://192.168.0.20)

NOTE: The Medline's IP address can also be changed to match an existing network. *See Operation Section entitled, Configuring the Network Settings.*

(continued)

Using File Pages
Opening a File

Files are listed in alphabetical order. The "A-Z" and "Z-A" buttons provide options to show files in alphabetical order or reversed alphabetical order.



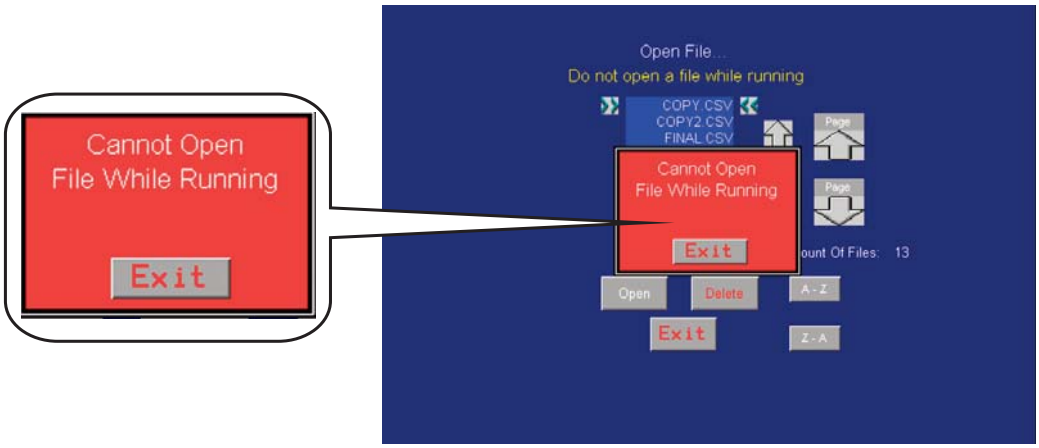
To open a file:

1 **Press the "Open" button that is located on the main File Page.**

2 **Once on the Open File Page, press directly on the file name or select the file by using the "Up" or "Down" buttons.** If there are more than ten files saved within the File Pages, larger "Page Up" and "Page Down" arrow buttons will be visible that will allow the user to scroll through the saved files, ten files at a time. Double chevron arrows are used to indicate the file to be selected.

3 **Press the "Open" button once the file to be open is highlighted.**

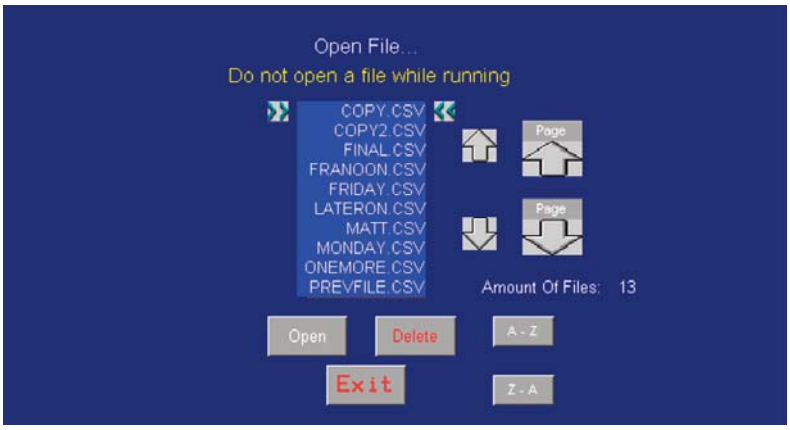
IMPORTANT: Files can not be opened while the machine is running.



Using File Pages (continued)

Deleting a File

A file may be deleted by using the arrow buttons and then pressing the "Delete" button. A red warning appears detailing which file is about to be deleted with options to keep or discard the file



To delete a file:

1 **Press the "Open" button that is located on the main File Page.**

2 **Once on the Open File Page, select the file by using the "Up" or "Down" buttons.** If there are more than ten files saved within the File Pages, larger **"Page Up"** and **"Page Down"** arrow buttons will be visible that will allow the user to scroll through the saved files, ten files at a time. Double chevron arrows are used to indicate the file to be selected.

3 **Press the "Delete" button once to delete the file that is highlighted.** A red warning appears detailing which file is about to be deleted with options to keep or discard the file.

4 **Press the "Discard" button the delete the file or the "Keep" button to keep the file.**

To exit the Open File Page:

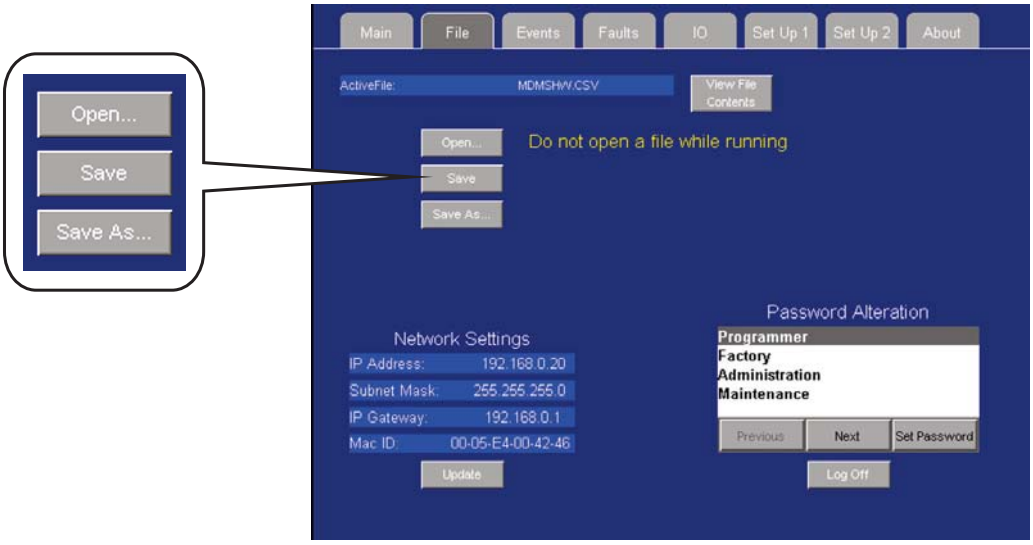
1 **Press the "Exit" button to exit from this page.** The current file will remain open.

Using File Pages (continued)

Saving a File

A file can be saved using the “Save” or “Save As...” buttons.

The “Save” button should be used when making changes to a file that is currently open.



To update a current file using the “Save” button:

1 Press the “File” tab after changes have been made to the current running program.

2 Press the “Save” button to update the current file.

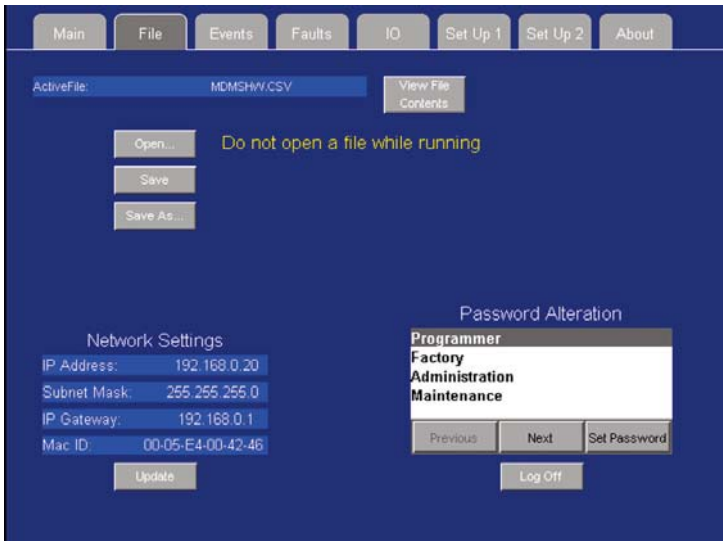
The “Save As...” button is used when a new filename is required. An area is provided to enter the filename. Filenames must comply with the 8,3 DOS operating system convention. There is no need to enter the .CSV extension. This has already been filled in automatically.

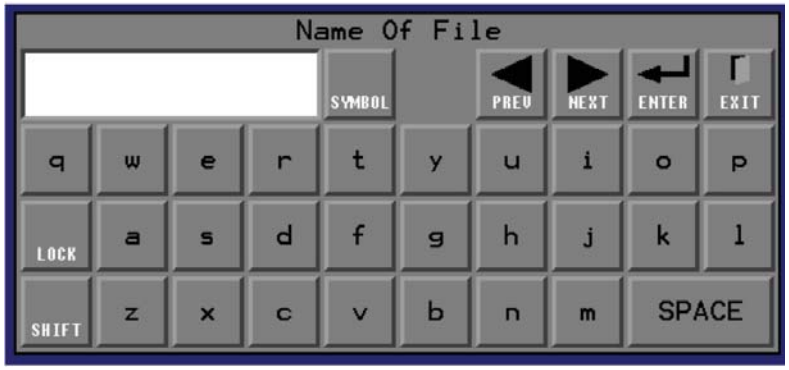
To create a new file using the “Save As...” button:

1 Press the “File” after creating a new running program.

2 Press the “Save As...” button to save the new file.

Using File Pages
Saving a File (continued)



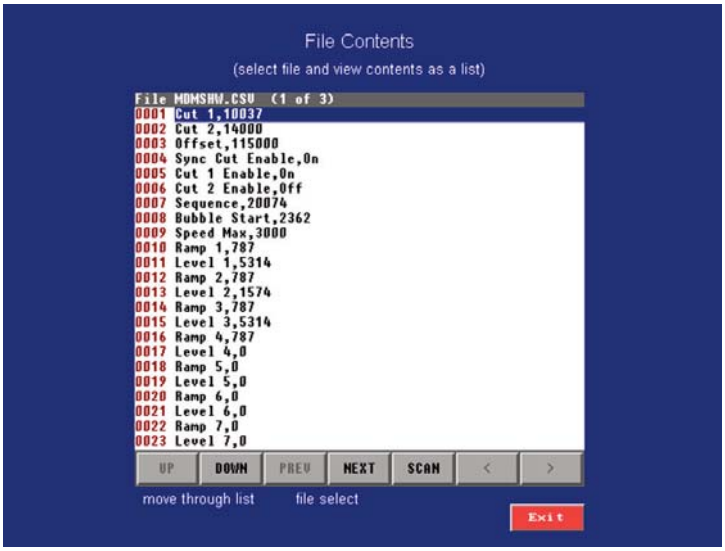


3 **Enter in a new file name in the pop-up keyboard.** (Up to eight characters)

4 **Press the "Enter" button to lock in the new file name.** The pop-up keyboard will be removed and the main File Page will be displayed.

Using File Pages (continued)

File Contents



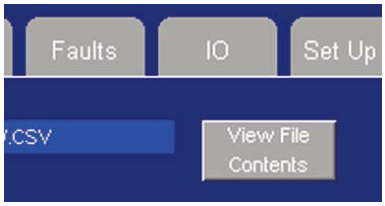
The contents of any saved file can be viewed using the File Contents feature. From the File Page, you can select to view the contents of any file.

✎ **NOTE:** The "<" and ">" buttons are used only to scroll sideways if there are multiple columns.

To view the contents of a file:

1 **Press the File tab,** if not currently at the File Page.

2 **Press the "View File Contents" button.** A File Contents Page will be displayed.



3 **Use the "Up" and "Down" buttons to scroll through the file contents.**

4 **Press the "Exit" button when finished viewing file contents.**

It is possible to view the contents of other files by using the "Next" and "Prev" buttons. The filename of the file that is being viewed will be displayed at the top of the File Contents Page.The sample above shows how to view the contents of a specific file.

Configuring the Network Settings

The Medline Combination Puller/Cutter's touch panel has Ethernet capabilities. For the Ethernet to function correctly the control must be set to conform to the current network. The control must be rebooted for new settings to take effect. This can be achieved by cycling the power on the control or by pressing the "Update" button.

To setup or update the Network Settings:

1 Press the setting to be configured or updated. (IP Address, Subnet Mask, IP Gateway or Mac ID)

2 A pop-up keyboard will appear, enter in the required setting and press "Enter". The keyboard will be removed.

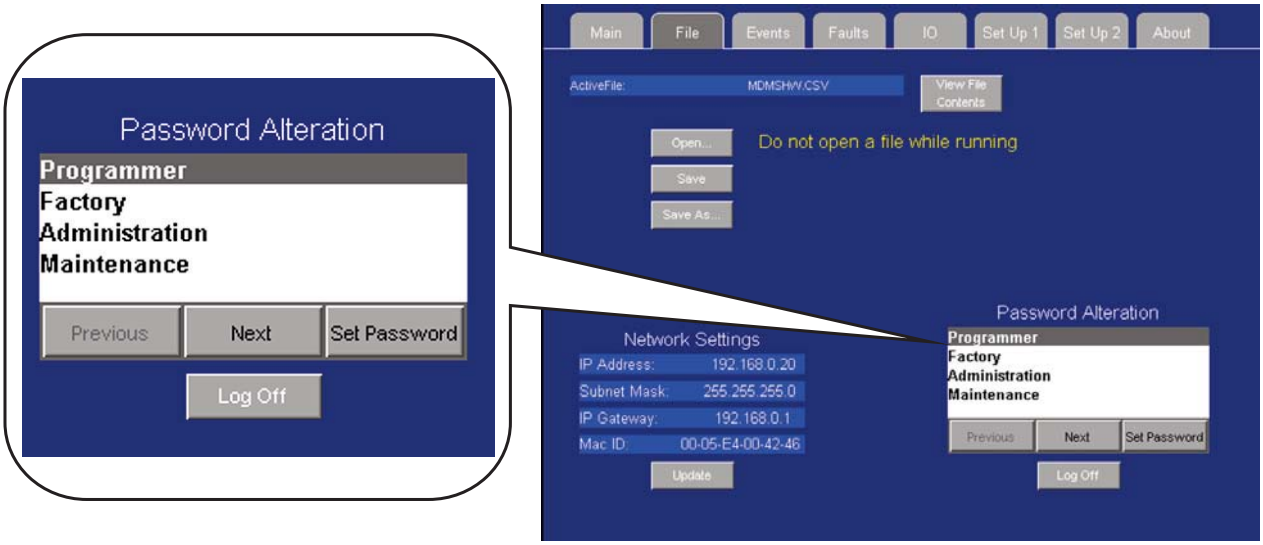
3 Press the "Update" button to use the new settings.

The "Update" button reboots the panel. A warning is given to ensure the operator is fully aware of what is about to happen.

The options are to "Reboot" or "Exit". An interruption to the program happens during the reboot. **DO NOT REBOOT WHILE THE MACHINE IS RUNNING.** Network configuration is typically done only once.

Changing the Password

This feature is provided to change a password. The user can access and change their own password only. Factory personnel have the option to rewrite any user password.



To change a user password:

1. **Press the File tab if not currently at the File Page.**

2. **Press the "Next" or "Previous" buttons located by the Password Alteration window** to select the username's password to be changed.

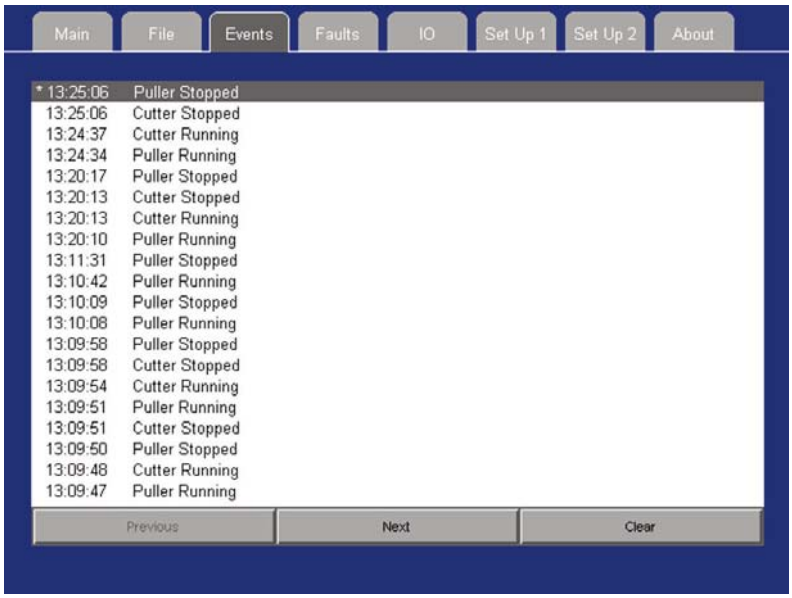
3. **Press the "Set Password" button, a pop-up keyboard will appear prompting the user to re-enter the old password before entering the new password.** *See Operation Section entitled, Accessing Secured Pages and Presets.*

4. **Press the "Enter" button after the new password has been entered.** The keyboard will be removed.

Pressing the "Log Off" button will log off the current user.

To log back into any section that requires a username and password, *see Operation Section entitled, Accessing Secured Pages and Presets.*

Using the Events Page



To access the Event Page:

1 Press the Events tab.

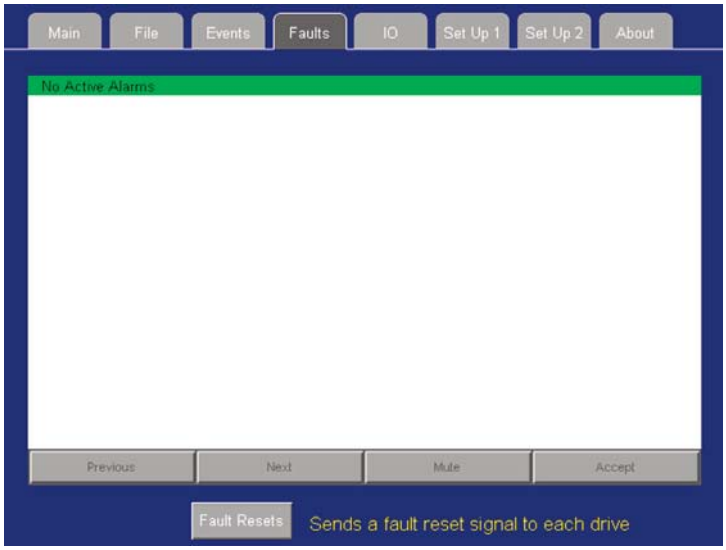
The Events Page is used to record changes in activity. Cutter and puller events are being recorded in the example. A variety of different events are recorded and time stamped.

- **"Previous"** and **"Next"** buttons become active after the list expands to allow movement through the list.

- The **"Clear"** button can be used to erase the list.

NOTE: The panel has the ability to record events to the compact flash memory card. Currently, this feature is disabled. Contact a Conair Representative if you require this feature.

Using the Faults Page



To access the Faults Page:

1 Press the Faults tab.

If a fault occurs the screen will flash and an alarm will sound from the touch-screen. Some faults clear automatically, others need maintenance attention.

When a fault takes place this page indicates which drives are involved and explains the fault. Drive programs have a check and clear routine for faults in their start up routines. Sometimes pressing "Stop", followed by "Start" will be enough to clear a fault. There is also a master "Fault Resets" button on this page. By pressing this button a fault clear signal is sent to every drive.

IMPORTANT: It is advisable to take note of any faults and diagnostic codes that are presented.

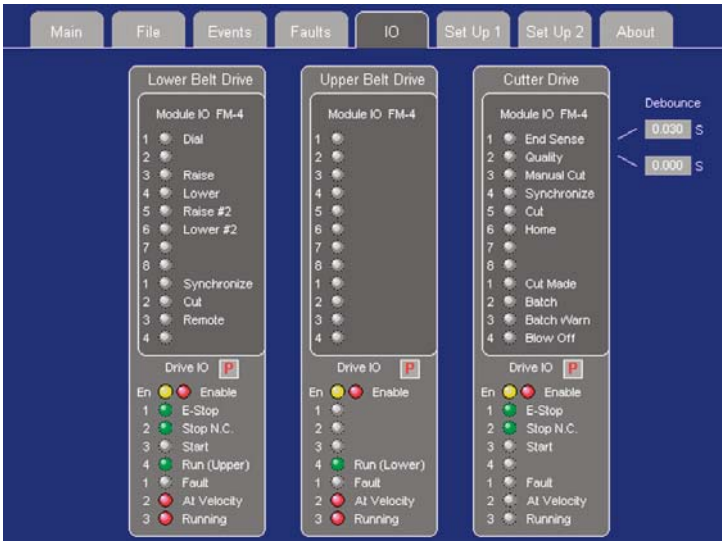
- **"Previous"** and **"Next"** buttons are available to move through the list.
- An individual fault can be acknowledged by highlighting it with the **"Previous"** and **"Next"** buttons followed by pressing the **"Accept"** button.
- **"Mute"** will leave faults showing but will clear the sounding alarm.

When all faults are cleared the sounder is silenced.

✎ **NOTE:** Diagnostics characters on the drives may be viewed through the door window of the lower electrical cabinet. The IO Page also shows diagnostic characters.

✎ **NOTE:** The panel has the ability to record faults to the compact flash memory card. Currently, this feature is disabled. Contact a Conair Representative if you a need for this feature.

Using the IO Page



To access the IO Page:

1 Press the IO tab.

At the top of each drive image is a title to show which motor it operates. The drives are in the same order inside the electrical enclosure, which can be viewed through the door window. Drives are mounted on a common backplane.

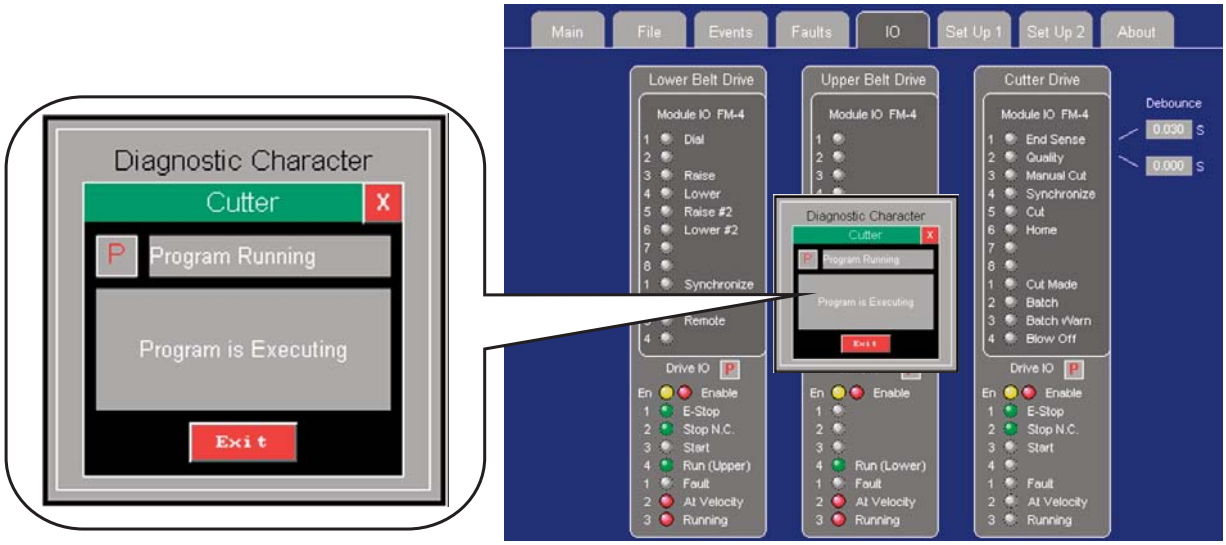
IO refers to digital inputs and outputs at the drive and at the FM-4 program module that is clipped on to the front of the drive. Inputs that are active are shown with green lights. Outputs that are active are shown with red lights. The IO number is shown to the left of each indicator. Inputs and outputs that have program assignments are labeled accordingly at the right of each indicator.

NOTICE: The drive has 4 inputs and 3 outputs. A further 8 inputs and 4 outputs are available on the FM-4 program module. Please refer to the Control Techniques drive and FM-4 manuals that came with your machine for additional information. Also, please refer to the schematics that came with your machine when tracing and diagnosing issues.

Each drive has an additional input designated as a drive enable (shown using a yellow light). Actual Drive Enable can be affected by different issues, e.g. if a fault is active. For that reason one further light (red) shows if the drive is enabled.

Using the IO Page (continued)

Diagnostics Character



Drives include a diagnostics character on the front of every drive. A copy of the character is shown on this page. In this example, all drives show a 'P' which means programs are running.

To view a diagnostics character:

1 Press any diagnostics character on the touchscreen to show a basic and detailed pop-up description for that code.

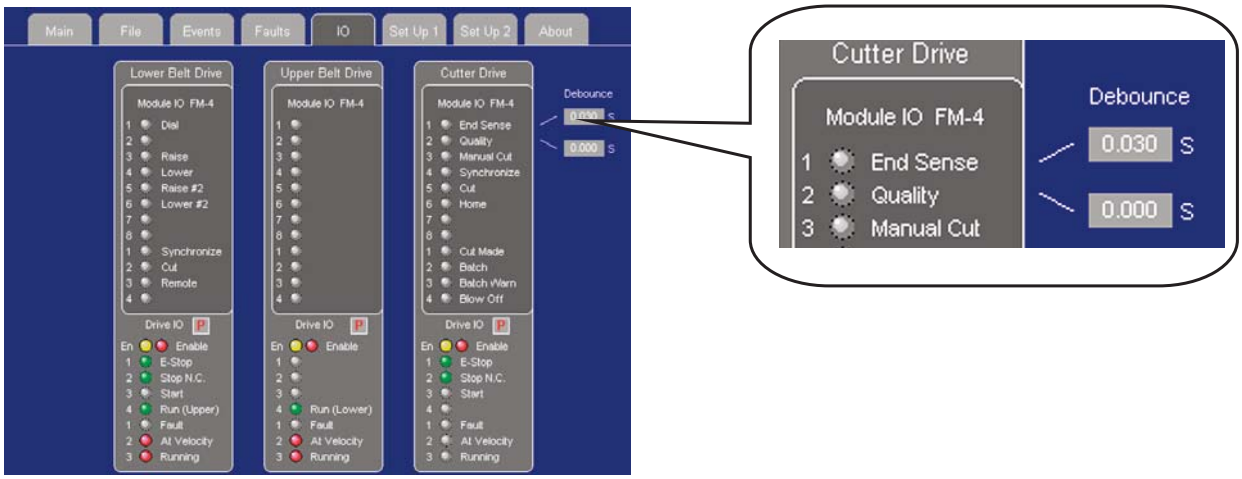
Descriptions shown on the pop-up match those found in the Control Techniques manual.

2 Press the “Exit” button or “X” on the top right-hand corner of the screen pop-up description box to remove the box.

Using the IO Page

Debounce (continued)

The cutter portion has two inputs with adjustable filters. These are End Sense (used by Product mode) and Good/Bad. Debounce filters are measured in seconds to three decimal places. When relay or switch contacts are used these should be filtered between 0.005 and 0.100 seconds. When the signal input is from a transistor or solid-state driver set the debounce amount to zero.



To adjust End Sense or Good/Bad input time filter Debounce time:

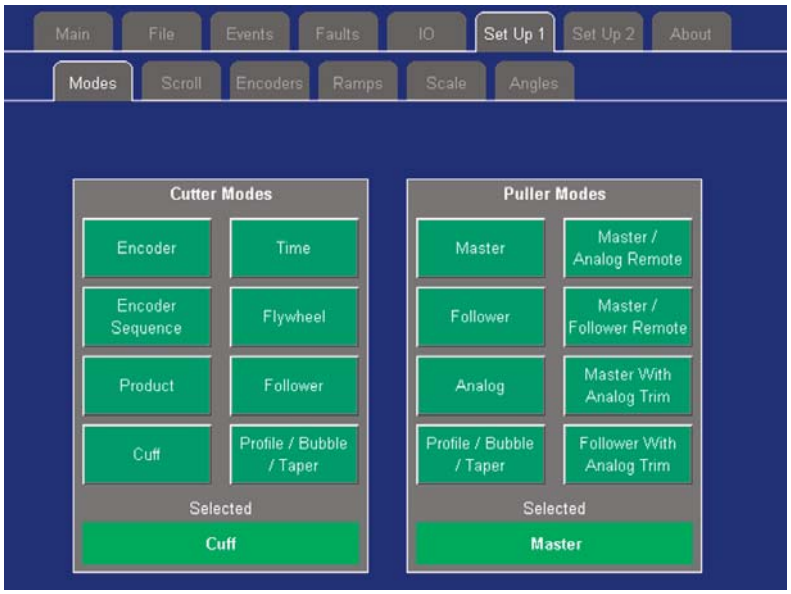
1. **Press the End Sense or Good/Bad Debounce window.** A numeric pop-up keyboard appears.

2. **Key in the new End Sense or Good/Bad input Debounce time duration.**

3. **Then press "Enter".** The pop-up keyboard is removed.

4. **The new End Sense or Good/Bad input Debounce time amount will appear in the End Sense or Good/Bad input Debounce window** and will then be active.

Configuring the Set Up 1 Folder
Modes Page



✎ **NOTE:** Modes Page sample for a combination puller/cutter equipped with all options displayed.

IMPORTANT: Only personnel with maintenance rights can access this page.

To access the Modes Page:

1 Press the Set Up 1 tab.

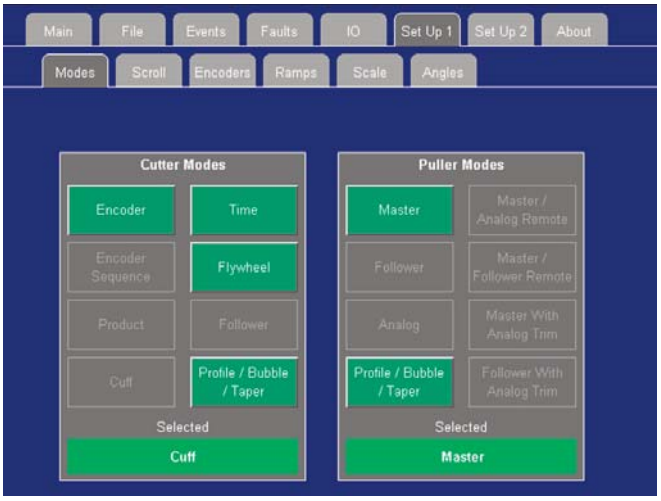
2 The Modes sub-tab is defaulted to appear first when the main tab "Set Up 1" is pressed.

The cutter and puller have up to eight modes available each. Unavailable modes are grayed out. The current selection is shown at the bottom of each selector and is also shown at the bottom of each control on the Main Page. In this sample, the cutter is in Cuff Mode and the puller is in Master Mode.

(continued)

Configuring the Set Up 1 Folder

Modes Page (continued)

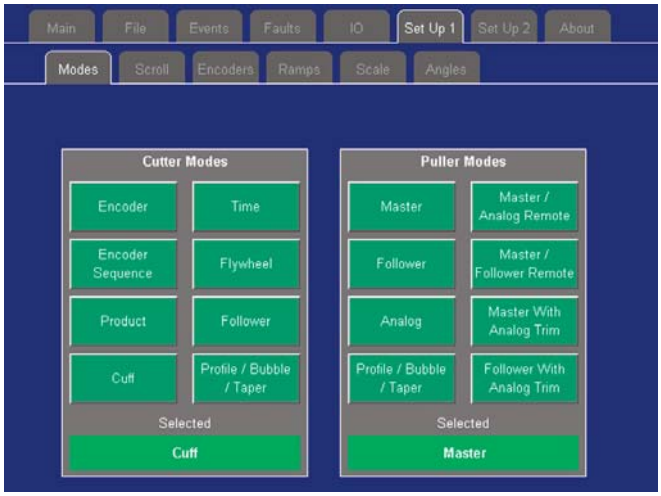


Control sample with fewer modes

Modes may be changed only when the machine is stopped. All options are grayed out while the machine is running. In addition, a red warning message for each control is shown to explain "Cannot change modes when running".

Warning messages shown on Modes Page

Configuring the Set Up 1 Folder
Selecting Modes



To select a mode for either the cutter or puller:

1 **Press the appropriate mode for either the cutter or puller.**

2 **The selected mode will appear at the bottom of each section.**

3 **Press the Main tab when finished selecting modes.**

See Operation Section entitled, Mode Page Descriptors - Puller/Cutter Modes

✎ **NOTE:** Profile/Bubble/Taper Modes will need to be set for both the puller and cutter sections. *See Operation Section entitled, Mode Page Descriptions - Puller Modes, Profile/Bubble/Taper Mode and Mode Page Descriptions - Cutter Modes, Profile/Bubble/Taper Mode.*

Mode Page Descriptions - Puller Modes

Master Mode

When the puller is in Master Mode it directly controls the speed of the extrusion line. In this instance the puller is the Master. Sensors may be included in the extrusion process to monitor the product and auto-correct the speed as in an automated diameter size process. Auto-corrections are made to the same preset that the operator uses.

The operator can enter in a new value at the Main Page to control speed. Alternatively, the operator may use the (+) and (-) buttons on the Main Page with any one of four user-preferred scroll amounts in order to trim the puller speed to the required level. In a typical application the operator uses both coarse and fine methods. The keyboard method would be used first to set the approximate coarse speed. Afterwards, the speed is nudged up or down using the (+) and (-) buttons using fine scroll increments to achieve the exact speed that is desired.

NOTE: In Follower Mode remotes are used to make ratio changes. *See Operation Section entitled, Mode Page Descriptions - Puller Modes, Remotes.*

Follower Mode

The puller may follow an upstream source such as an encoder mounted on another puller or a puller with an encoder output built into the motor. The source must be a quadrature encoder. When the puller is in Follower Mode the operator does not set speed. Speed adjustments such as those needed to match the puller mechanical differences or product shrinkage/slippage can be made using Ratio. When scaled correctly a 1.000:1 ratio should provide an exact puller follow. *See Operation Section entitled, Set Up 2 Page Description, Tuning the Belt Drive.*

NOTE: In Follower Mode remotes are used to make ratio changes. *See Operation Section entitled, Mode Page Descriptions - Puller Modes, Remotes.*

Analog Mode

In most cases Analog is a Follower mode. A voltage such as a 0 to 10-volts is applied to set speed. A 10-turn potentiometer could be installed right at the puller in which case Analog would be a local Master Mode.

NOTE: In Analog Mode remotes are used to make ratio changes. *See Operation Section entitled, Mode Page Descriptions - Puller Modes, Remotes.*

Mode Page Descriptions - Puller Modes (continued)

Switchable Modes

Two of the modes listed are known as switchable modes. These have dual possibilities using a mixture of the modes already discussed. The puller can be started in one mode and then switched to another. A selector switch appears on the Main Page in the puller section whenever Master/Analog Remote or Master/Follower Remote modes are selected. In addition, indicator lights show which of the two modes are selected. Master in this configuration is referred to as Local.

NOTE: Remotes will affect speed or ratio as determined by the state of the local/remote selector switch. *See Operation Section entitled, Mode Page Descriptions - Puller Modes, Remotes.*

Bumpless Transfer
A feature known as "Bumpless Transfer" is included for switchable modes. This ensures that no speed change occurs when switching from remote to local. In this situation the actual velocity is copied into the local (master) setpoint to ensure they match. That way the local control is already at the correct speed and no further change is required. Bumpless Transfer is not available when switching from local to remote.

Trim Modes

Two of the modes available are known as Trim Modes. These are summation modes where two signals are added together to form the puller speed. Master with Analog Trim uses the speed set by the operator plus an analog correction. An analog position or loop sensor senses the product and provides the speed correction.

Follower with Analog Trim acts in a similar way. It uses a quadrature encoder to match puller speeds with an analog input to tune the ratio. This is done to balance speeds due to mechanical differences and product effects.

The Analog Trim portion is typically used to make small changes of a few percent.

A Trim “On/Off” button appears on the Main Page in these modes. It is available to enable or disable the Analog Trim input. Trim should be disabled when first starting a product line.

Mode Page Descriptions - Puller Modes (continued)

Profile/Bubble/Taper Mode

This is a special mode that is used to sequence through a set of velocity changes in order to make a product with varying diameters. It is similar to Master Mode except it has many setpoints (Master Mode has one setpoint). This mode is used with the Matching Mode on the cutter.

In this mode, the operator sets velocities and distances. Two distances are provided for every velocity. The first distance is the length used to make the speed change. Other names for this portion are the transition, ramp or the gradient. After this portion there is a steady state distance. Names for this second portion are maintained, steady and level. The programmed velocity is maintained throughout the second distance portion.

✎ **NOTE:** The small diameter portion of the profile may be referred to as tip or tube. The large diameter may be referred to as bump, body, bubble or belly.

Analog and digital outputs are included with Profile/Bubble/Taper Mode. These may be used to assist production. For example, it is typical to use air to assist at the extruder die for support of the profile. If a simple puff of air is required then the digital outputs are perfect for this to open and close a valve quickly. A more complex product would use the analog option. *See Operation Section entitled, Profile/Bubble/Taper Page Description.*

Remotes

Remote Contact Type
Two versions of Remote are available that also effect the set puller speed. One method uses wired raise and lower contacts (a 3-wire system). Contacts that can be controlled manually (remote buttons) or can be controlled from an automated diameter gauge. The change amount for each contact closure is a user-preferred setting and is available on the Set up 1 Scroll page. The programmed change (up or down) is made when the remote contact changes from open to closed. While a contact remains closed a further programmed change will be made every half second.

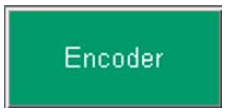
Remote Digital Pot Type
Another style of Remote is a type that uses a digital rotary potentiometer. A digital potentiometer can be rotated continuously in either direction, at a fast or slow rate. It has a similar feel to a 10-turn analog potentiometer but has no mechanical limits and is unaffected by electrical noise. Clicks of the dial (36 clicks per revolution) can be programmed to any increment size on the Set Up 1 Scroll page. For example, the smallest increment can be programmed to make a 0.01-FPM change (0.36-FPM per full revolution).

Mode Page Descriptions - Cutter Modes

Time Mode

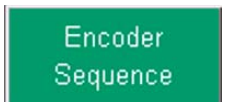
Time Mode is used to set a time interval between cuts. For example, a setting of 1.000 will ensure that one cut is made per second. Time can be adjusted using thousandths of a second increments.

Encoder Mode



Encoder Mode is used to set product length using distance obtained from an encoder. In the Combination Puller/Cutter an encoder is built into the puller motor. This encoder is used to provide length information to the cutter. Encoder Mode is typically scaled in inches to three decimal places.

Encoder Sequence Mode



This is a variation of Encoder Mode that has up to four cut lengths available. Lengths occur in a sequence that has length 1 through 4 and then repeats, cutting each length once. Encoder Sequence can be used for production of simple kits. Options are for 2, 3 or 4 cut lengths. For single lengths use only the Encoder mode. *See Operation Section entitled, Encoder Sequence Page Description.*

Product Mode

This mode requires a sensor to trigger a cut. Options are available to cut using the rising, falling or both edges of the input. To prevent unwanted double cuts a Hold-Off preset is available that can be used to ignore the sense input immediately after a cut. This helps to ignore the bounce that sometimes happens to the product when the blade hits. Hold-Off is in seconds to three decimal places.

Flywheel Mode

Flywheel Mode is typically used to produce very short cut lengths. In this mode, the blade spins continuously at a fixed RPM. The cut length is a result of RPM and line speed. The length area on the Main Page uses a capture feature whenever the blade hits a certain angle, e.g. blade at cut position. The length between two consecutive cut positions will be shown.

NOTICE: Flywheel mode can have multiple blades fitted. A circular, or balanced arm style blade holder should be fitted for multiple blade positions.

Mode Page Descriptions - Cutter Modes (continued)

Follower Mode

Follower Mode is similar to Flywheel Mode where the blade spins continuously. However, in this mode the operator sets a length and the blade spins at the RPM needed to make that length. The cutter calculates a gear ratio based on length and puller speed. It then remains at that gear ratio. This mode is also known as Gear Lock. The line speed should remain stable within ±5%. If the gear ratio required to make the product causes the blade to exceed the upper or lower RPM limits the cutter will stop.

Cuff Mode

Cuff Mode is used with corrugated style products that have cuff sections. It uses a sensor to detect the cuff on the upstream side of the cutter and the encoder to provide the cuts at an offset distance after detection. Cuffs and corrugations are produced in a mold block style puller. This machine is known as a Corrugator. Product exits the corrugator then goes into the Combination Puller/Cutter. The cuff is detected and a cut is made at the required position within the cuff.

Cuff detection is usually made by a sensor built into the in-going cutter bushing. It looks at the cross section of product at the edge. The control must be programmed with details of the cuff such as if it is opening or breaking the light beam of the sensor. Also, the length must be sustained at a certain level before the section can be considered to be a cuff. The acknowledge length must be able to differentiate between cuff and corrugations.

Once the cuff has been acknowledged, up to three cuts may be made. The time from the blades's parked position to its cut position affects the first cut. A change in line speed will also affect this position. It is important to maintain a steady line speed. Cuts 2 and 3 are optional. Cut 2's distance is relative to Cut 1 and Cut 3's distance is relative to Cut 2. The maximum number of cuts per minute must not be exceeded in this exercise. Cuts that are attempted that are not allowed will be ignored. *See Operation Section entitled, Cuff Page Description.*

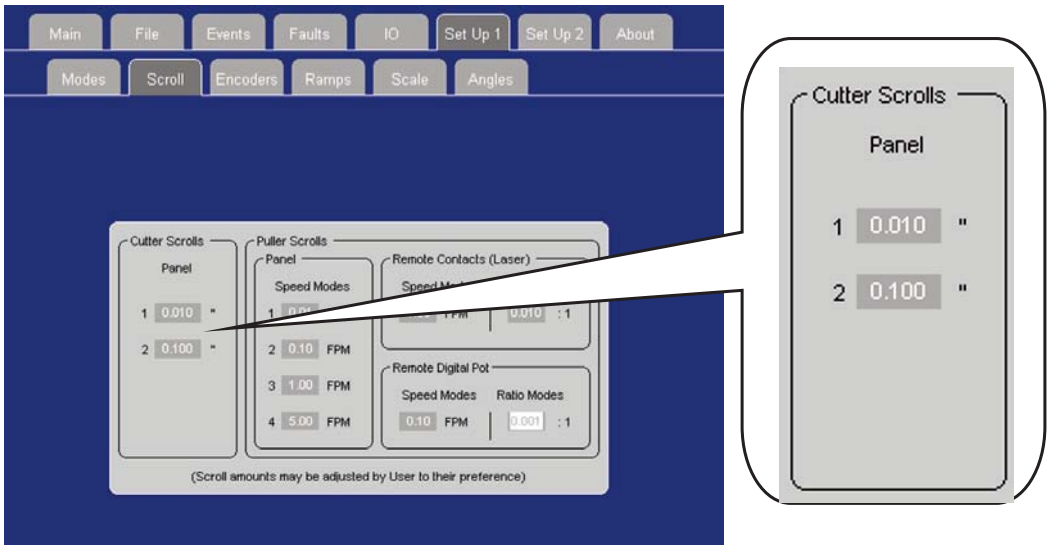
Mode Page Descriptions - Cutter Modes (continued)

Profile/Bubble/Taper Mode

This mode is used with the Matching Mode on the puller. Cut distances are measured using the encoder but are synchronized to the profile sequence. Each time the puller starts a profile sequence it outputs a sync signal to the cutter and PLC's. The cutter uses the sync signal to load cut lengths into a queue. No cuts are made at this time. A physical distance (extruder die head to cutter) is used as the queue length. After this distance has passed the cut lengths are eventually removed from the queue. This is when the cuts are made. *See Operation Section entitled, Profile/Bubble/Taper Page Description.*

Scroll Page Descriptions

Cutter Scrolls - Panel



Two scroll increments are available to adjust the cut length. Pressing the Scroll Size window in the cutter section on the Main Page will toggle between the two values. Pressing the (+) or (-) buttons in the Cut Length window will increase or decrease the cut length by the selected scroll size. These values are typically used to make fine correctional adjustments.

The Scroll Page is used to change these scroll increment setpoints for both the puller and cutter sections.

To access the Scroll Page:

1 Press the Set Up 1 tab.

2 Press the Scroll sub-tab.

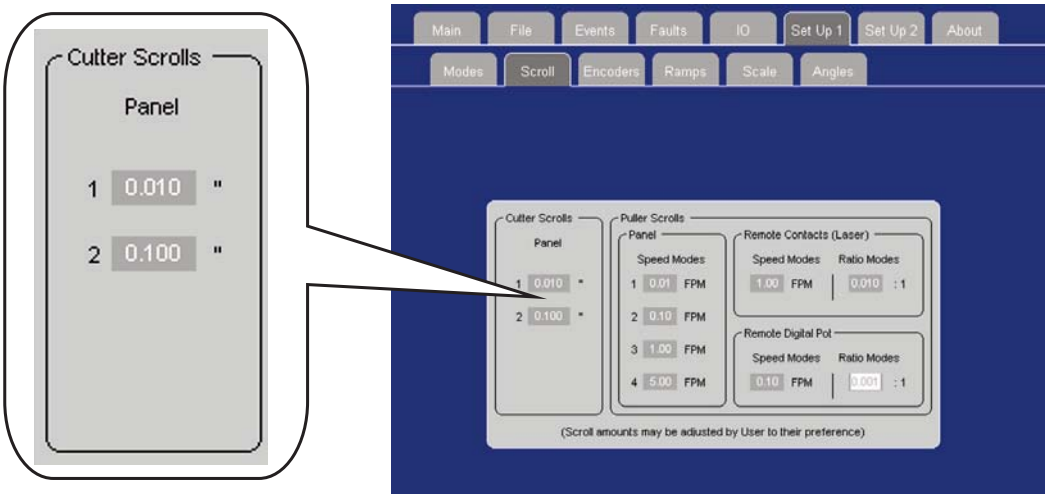
Scroll amounts are the user preferred values.

(continued)

Scroll Page Descriptions

Cutter Scrolls Panel (continued)

Two setpoints on the Cutter Scrolls Panel are used to adjust the cutter control. One setpoint is for course trimming, the other is for fine trimming.



To change the Cutter Scroll Size increments:

1 **Press the first Cutter Scroll window.** A numeric pop-up keyboard appears.

2 **Key in the new scroll increment.**

3 **Then press "Enter".** The pop-up keyboard is removed.

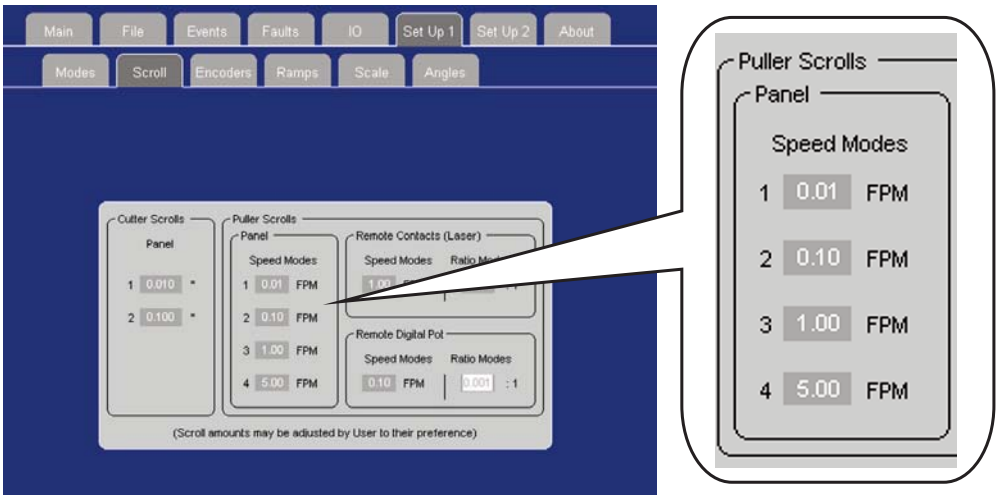
4 **The new scroll increment will appear in the Cutter Scroll window** and will then be available.

5 **Repeat steps for the second scroll increment.**

Scroll amounts are the user preferred values.

Scroll Page Descriptions (continued)

Puller Scrolls - Panel



The (+) and (-) buttons on the puller control shown on the Main Page can be used to add or subtract any of these four values to the speed setpoint. These values are typically set to a range that will give both coarse and fine control. An operator can use coarse settings to gradually bring the line up to speed during a startup. Finer selections would then be used when getting close to the desired line speed. The operator can switch through this list of settings on the Main Page by pressing the puller Scroll Size window.

The values in this list can be set in any order. It is recommended that they be placed in a descending order for line set up where the operator can begin with coarse settings and then end with fine.

To change the Culler Scroll Size increments:

1 **Press the first Puller Scrolls window.** A numeric pop-up keyboard appears.

2 **Key in the new scroll increment.**

3 **Then press "Enter".** The pop-up keyboard is removed.

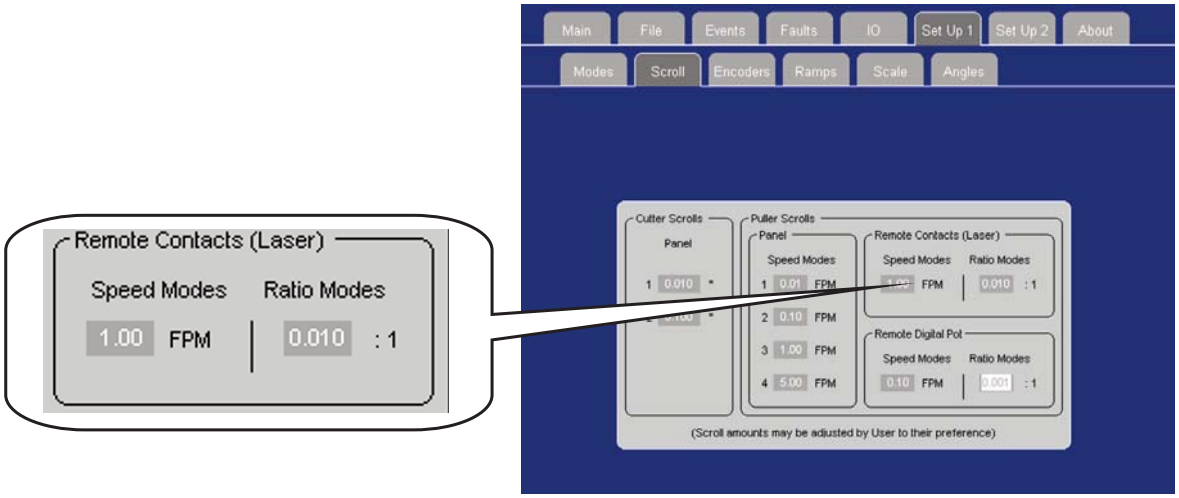
4 **The new puller scroll increment will appear in the Puller Scroll window** and will then be available.

5 **Repeat steps for the remaining puller scroll increments.**

Scroll amounts are the user preferred values.

Scroll Page Descriptions (continued)

Puller Scrolls - Remote Contacts



Two settings are available for remote contacts (laser gauge or switches that are located at the extruder) that are used to increase or decrease the puller speed. One is used for Speed Modes such as Master Mode. A contact closure or switch will add or subtract this increment to the speed setpoint on the Main Page.

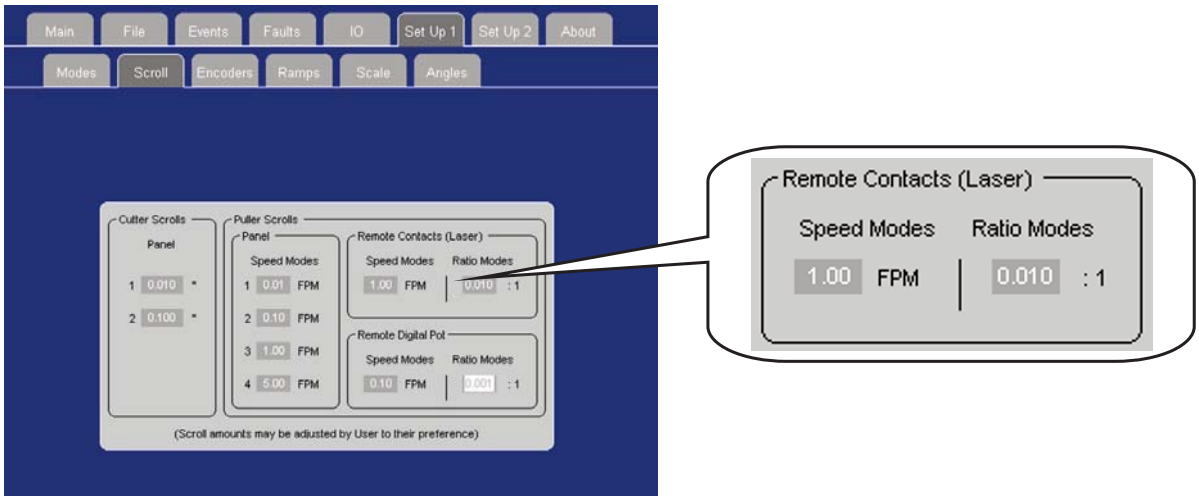
To change the Speed Modes scroll increment:

1. **Press the Speed Modes FPM window.** A numeric pop-up keyboard appears.
2. **Key in the new scroll increment.** Lower product line speeds will require a smaller increment change, higher product line speeds will require a larger increment change.
3. **Then press "Enter".** The pop-up keyboard is removed.
4. **The new scroll increment will appear in the Speed Modes window** and will then be available.

✎ **NOTE:** Remote Contacts scroll increments are dependent on the type of product that is produced and user preference.

Scroll Page Descriptions

Puller Scrolls - Remote Contacts (continued)



The second Remote Contacts scroll preset is used for Ratio Modes such as Analog or Follower Modes. A contact closure or switch will raise or lower the ratio by the increment entered. An example of this is if the speed ratio increment is set to 0.010 one signal or press of the Remote Contact or switch would adjust the puller to run at ±1% of its set speed. A further example is, if the ratio is set to 0.100, one signal or press of the Remote Contact or switch would adjust the puller to run at ±10% of its set speed.

To change the Ratio Modes scroll increment:

1 **Press the Ratio Modes window.** A numeric pop-up keyboard appears.

2 **Key in the new scroll increment.** Lower product line speeds will require a smaller increment change, higher product line speeds will require a larger increment change.

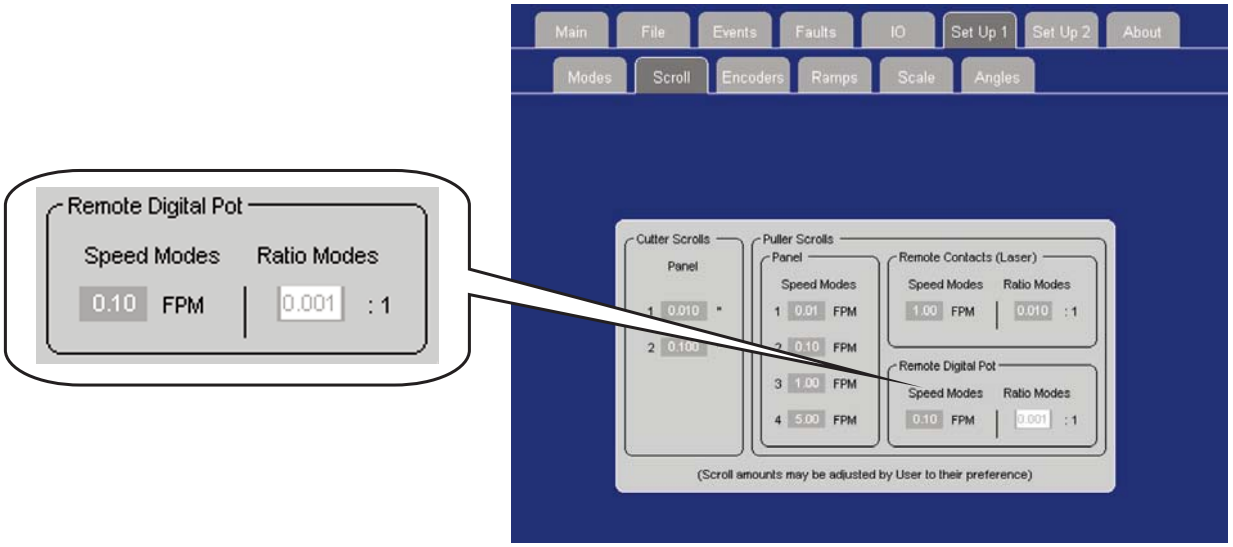
3 **Then press "Enter".** The pop-up keyboard is removed.

4 **The new scroll increment will appear in the Ratio Modes window** and will then be available.

NOTE: Remote Contacts scroll increments are dependent on the type of product that is produced and user preference.

Scroll Page Descriptions (continued)

Puller Scrolls - Remote Digital Pot



Two settings are available for remote digital pot. One is used for Speed Modes such as Master. A click clockwise or counterclockwise made by rotating the digital potentiometer will add or subtract this increment to the speed setpoint on the Main Page.

To change the Speed Modes scroll increment:

1 **Press the Speed Modes FPM window.** A numeric pop-up keyboard appears.

2 **Key in the new scroll increment.** Lower product line speeds will require a smaller increment change, higher product line speeds will require a larger increment change. Also, this number is dependent on the number of rotations of the remote digital potentiometer's rotary dial. For fewer rotations set a courser number, for more rotations set a finer number.

3 **Then press "Enter".** The pop-up keyboard is removed.

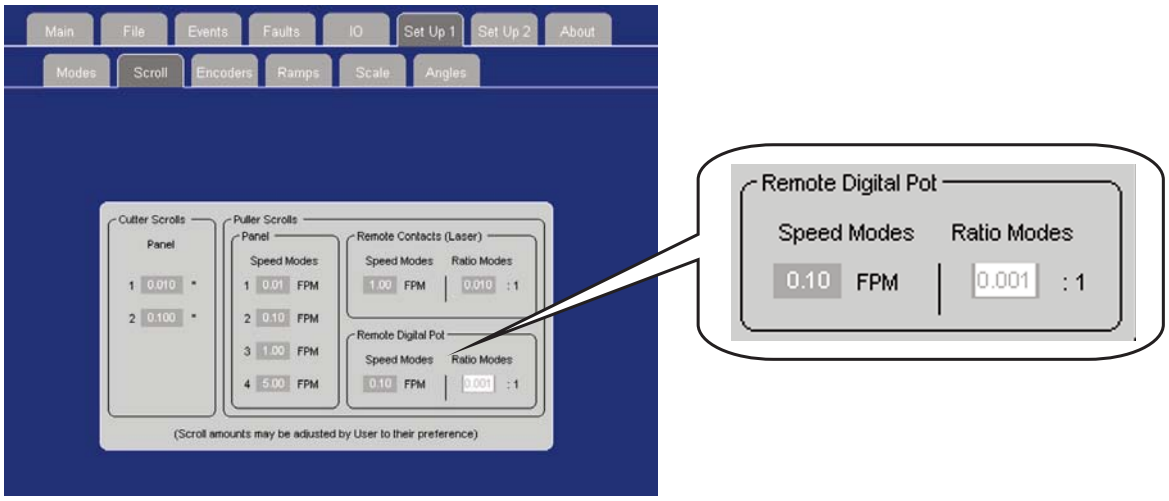
4 **The new scroll increment will appear in the Speed Modes window** and will then be available**.**

✎ **NOTE:** Remote Digital Pot scroll increments are dependent on the type of product that is produced and user preference.

(continued)

Scroll Page Descriptions

Puller Scrolls - Remote Digital Pot (continued)



The second Remote Digital Pot scroll preset is used for Ratio Modes such as Analog or Follower. Clicks clockwise or counterclockwise of the digital potentiometer's rotary dial will raise or lower the ratio by the increment entered. An example of this is if the speed ratio increment is set to 0.010, one click would adjust the puller to run at ±1% of its set speed. A further example is, if the ratio is set to 0.100 one click of the Remote Digital Potentiometer's rotary dial would adjust the puller to run at ±10% of its set speed

To change the Ratio Modes scroll increment:

1 **Press the Ratio Modes window.** A numeric pop-up keyboard appears.

2 **Key in the new scroll increment.** Lower product line speeds will require a smaller increment change, higher product line speeds will require a larger increment change. Also, this number is dependent on the number of rotations of the remote digital potentiometer's rotary dial. For fewer rotations set a courser number, for more rotations set a finer number.

3 **Then press "Enter".** The pop-up keyboard is removed.

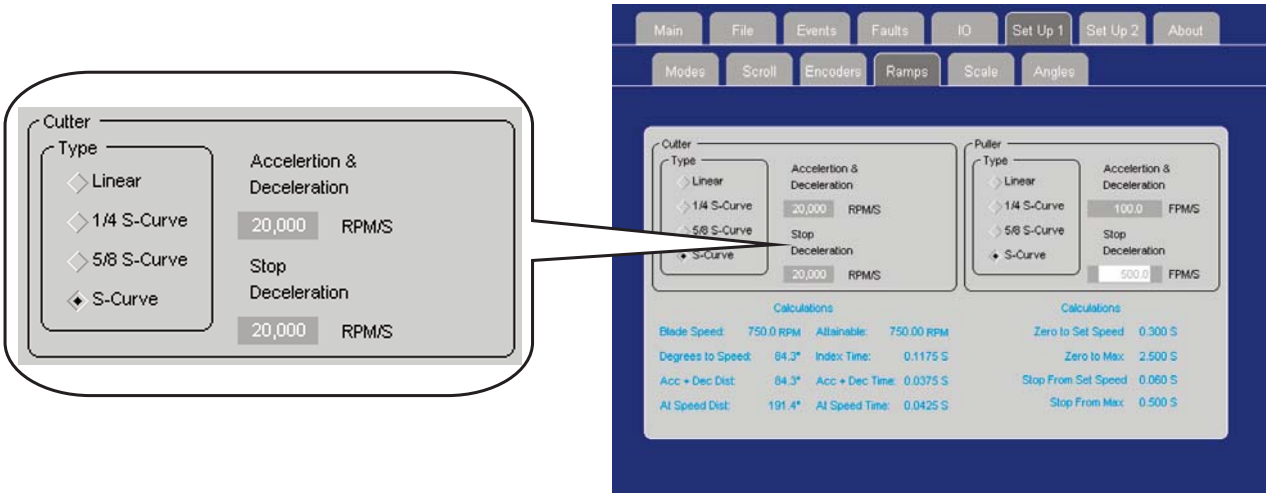
4 **The new scroll increment will appear in the Ratio Modes window** and will then be available.

✎ **NOTE:** Remote Digital Pot scroll increments are dependent on the type of product that is produced and user preference.

Encoders Page Description

The Encoders Page is for factory personnel only. Information contained in this page will not be mentioned in this Operator Instruction Manual.

Ramps Page Description



To access the Ramps Page:

1 Press the Set Up 1 tab.

2 Press the Ramps sub-tab.

Cutter

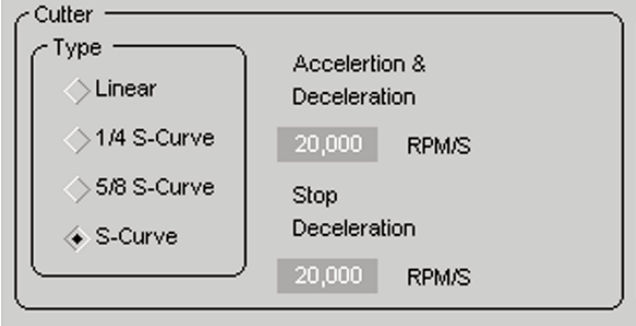
Four choices of ramp styles are available. S-Curves provide less wear on the mechanics of the cutter by use of smoothing at the beginning and end of the ramp. The middle of the profile is linear but uses a steeper gradient to compensate for the smooth ends. No matter which option of ramp is chosen the time and distance for a speed change will remain the same.

NOTE: Similar options are provided for each portion of the machine. Ramps are acceleration and deceleration.

(continued)

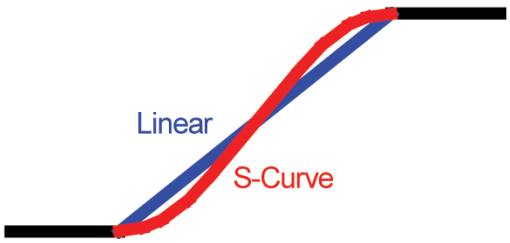
Ramps Page Description

Cutter (continued)



NOTE: All values can be changed by pressing individual windows and using the keyboard method to alter the value. *See Setting the Cutter Length, Keyboard Method.*

- **Linear - rate of change is constant throughout the speed change**
- **1/4 S-Curve - linear portion is 1.143 x average acceleration**
- **5/8 S-Curve - linear portion is 1.455 x average acceleration**
- **S-Curve - linear portion is 2 x average acceleration**



To change the Cutter Ramp type:

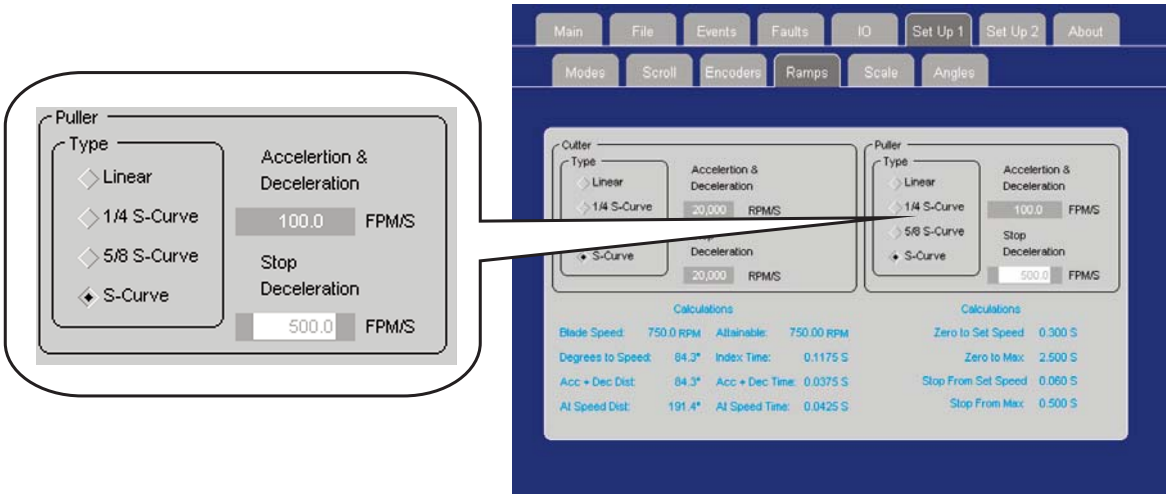
1 Press either the Linear, 1/4 S-Curve, 5/8 S-Curve or S-Curve radio button. A dot will appear in the radio button of the selected curve type.

- **Acceleration and Deceleration** setting is the rate of speed the cutter arm will take to achieve running speed or to slow down to a complete stop. The cutter's acceleration and deceleration rate is dependent upon the type of cutter arm being used.

- **Stop Deceleration** setting of the cutter is dependent upon they type of cutter arm being used. Stop deceleration is used to provide a quicker stop as a result of the "Cutter Stop" button being pressed. The stop rate should be set larger than the normal ramp.

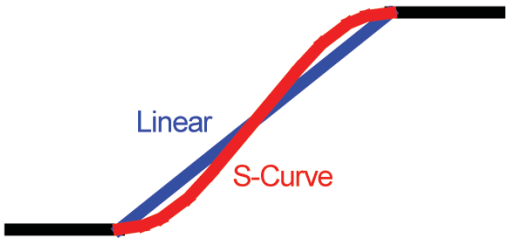
Ramps Page Description (continued)

Puller



Four choices of ramp styles are available. S-Curves provide less wear on the mechanics of the puller by use of smoothing at the beginning and end of the ramp. The middle of the profile is linear but uses a steeper gradient to compensate for the smooth ends. No matter which option is chosen the time and distance for a speed change will be the same

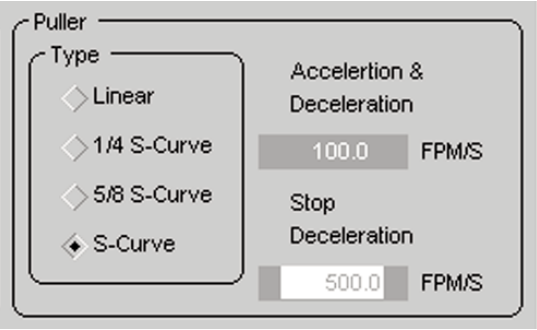
- **Linear - rate of change is constant throughout the speed change**
- **1/4 S-Curve - linear portion is 1.143 x average acceleration**
- **5/8 S-Curve - linear portion is 1.455 x average acceleration**
- **S-Curve - linear portion is 2 x average acceleration**



(continued)

Ramps Page Description

Puller (continued)



To change the Puller Ramp type:

1 Press either the Linear, 1/4 S-Curve, 5/8 S-Curve or S-Curve radio button. A dot will appear in the radio button of the selected curve type.

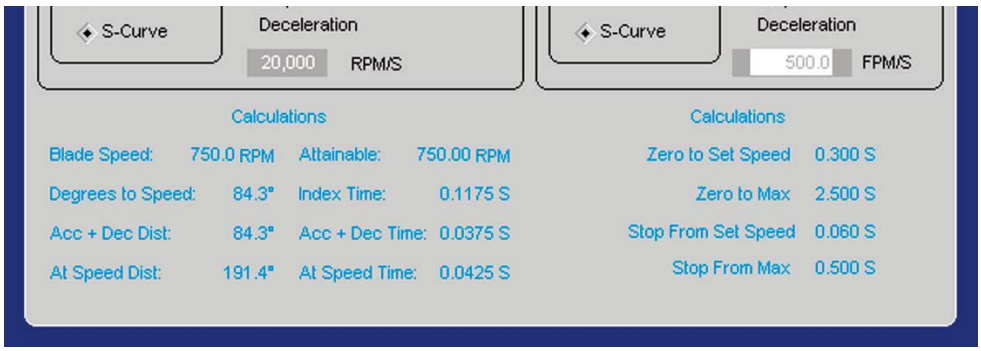
- **Acceleration and Deceleration** preset is the average rate of change that will be used for speed changes. For example, a puller set to 100 FPM will accelerate from zero in one second with a 100.0 FPM/S ramp.

- **Stop Deceleration** setting of the puller is dependent upon they type of puller used. Stop deceleration is used to provide a quicker stop as a result of the "Puller Stop" button being pressed. The stop rate should be set larger than the normal ramp.

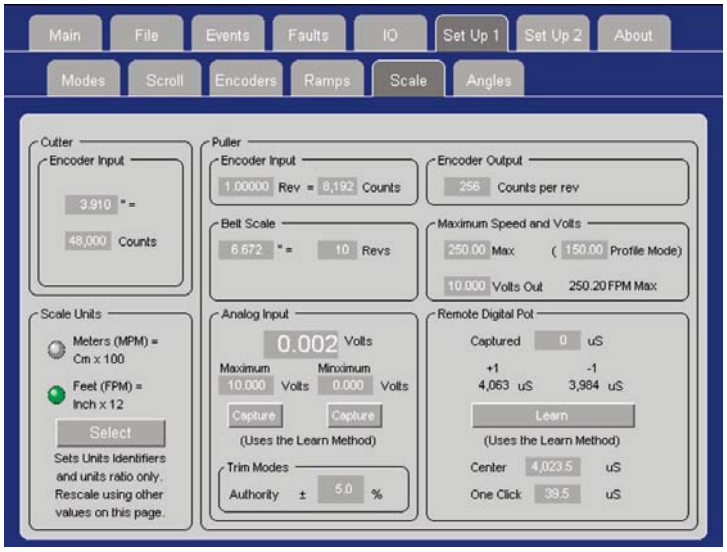
NOTE: All values can be changed by pressing individual windows and using the keyboard method to alter the value. *See Setting the Cutter Length, Keyboard Method.*

Calculations

Included at the lower portion of the page are sets of calculations. These have no effect on operation. They serve to provide information only.



Scale Page Description



The Scale page is available to set all scale values.

The Scale Page is used to calibrate all aspects of both the puller and the cutter to the match actual machine output.

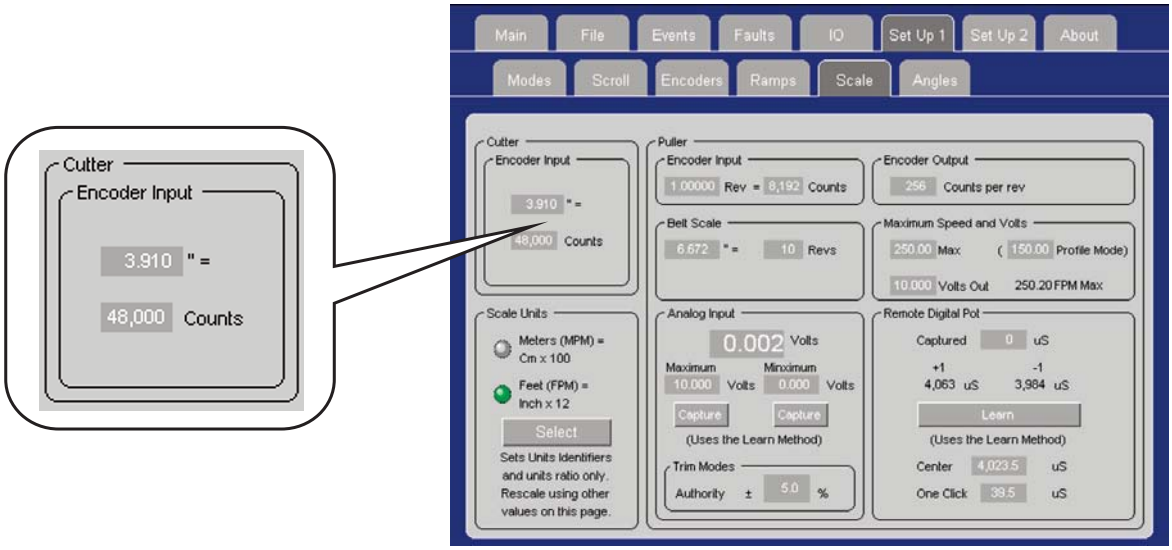
To access the Scales Page:

1 Press the Set Up 1 tab.

2 Press the Scale sub-tab.

Scale Page Description (continued)

Cutter - Encoder Input



Cutter Encoder Input comes from the encoder that is on the puller and is used to scale the encoder input used by the cutter. Two presets are used to set the counts per distance of the encoder input.

To change the Encoder Input distance:

1 Press the Cutter section's Encoder Input distance window. A numeric pop-up keyboard appears.

2 Key in the new distance. This is the length scaling of the material passing through the cutter bushing.

3 Then press "Enter". The pop-up keyboard is removed.

The counts per distance scale is used to scale the cutter's encoder input so that lengths entered at the cutter are the lengths that are made.

To change the Encoder Input Counts:

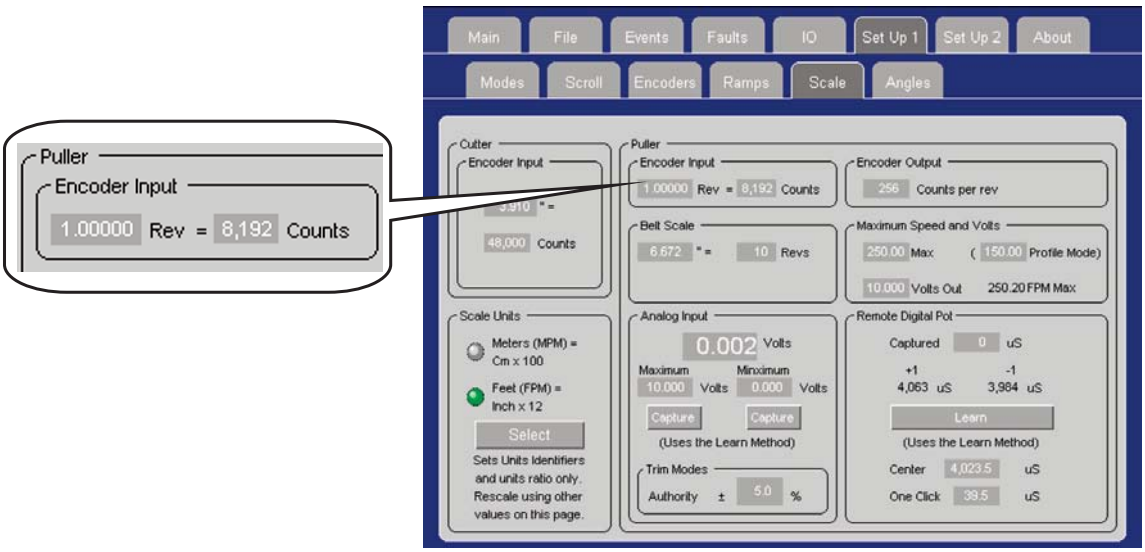
1 Press the Cutter section's Encoder Input Count window. A numeric pop-up keyboard appears.

2 Key in the Count amount.

3 Then press "Enter". The pop-up keyboard is removed.

Scale Page Description (continued)

Puller - Encoder Input



Puller Encoder Input is used to scale the encoder input of the lower belt for a Follower application. Two presets are used. In the example, the amount of counts per motor revolution are used. The scaling shown in this example matches a similar style of puller. The motors on the pullers have 2,048 pulses per motor revolution on both A and B channels. The system uses quadrature x 4 meaning that all four phase changes are counted for a total of 8,192 counts per motor revolution.

To change the amount of Puller Encoder Input revolutions:

1. **Press the Puller section's Encoder Input Revolutions window.** A numeric pop-up keyboard appears.

2. **Key in the new revolution amount.** This is the number of revolutions the puller shaft will rotate.

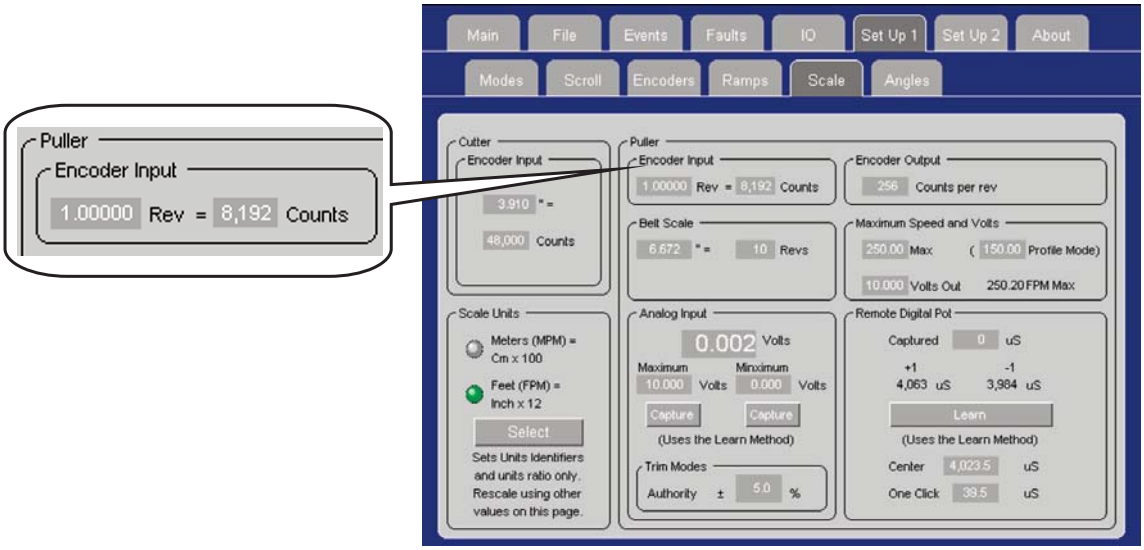
3. **Then press "Enter".** The pop-up keyboard is removed.

✎ **NOTE:** Refer to your specific style of puller encoder to properly scale the amount of counts per motor revolutions.

(continued)

Scale Page Description

Puller - Encoder Input (continued)



The puller motor rotates using counts received at the encoder input. In the example shown, the motor will rotate once for every 8,192 counts.

To change the Puller Encoder Input Counts:

1 **Press the Puller section's Encoder Input Count window.** A numeric pop-up keyboard appears.

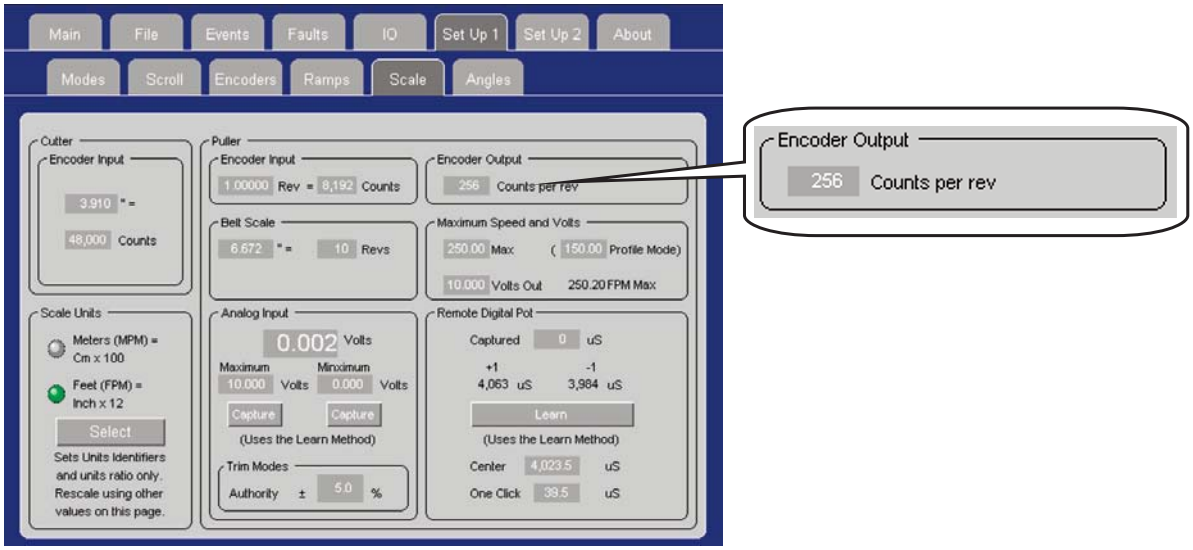
2 **Key in the new count amount.** This is the number of counts within the revolution amount made by the puller motor.

3 **Then press "Enter".** The pop-up keyboard is removed.

✎ **NOTE:** Refer to your specific style of puller encoder to properly scale the amount of counts per motor revolutions.

Scale Page Description (continued)

Puller - Encoder Output



A 2,048-pulse quadrature encoder is built into both puller servomotors. The drives have the motor encoder as an output on a 44-pin 'D' connector. Scaling is provided to set the amount of pulses that are outputted per motor revolution. Any integer number between 1 and 2,048 may be set.

In this application the output on the 44-pin 'D' connector is used by a PLC (Programmable Logic Controller) or multiple PLC's for the Profile/Bump/Taper Mode. The PLC's can accept a maximum frequency of 20KHz. A motor at 5,000-RPM maximum with a 2,048 pulse per revolution encoder will output 170,667 Hz. This far exceeds the capability of the PLC (Programmable Logic Controller). Instead, the setting of 256 counts per revolution will be used.

To change the amount of Puller Encoder Output counts per revolution:

1 **Press the Puller section's Encoder Output Counts Per Revolutions window.** A numeric pop-up keyboard appears.

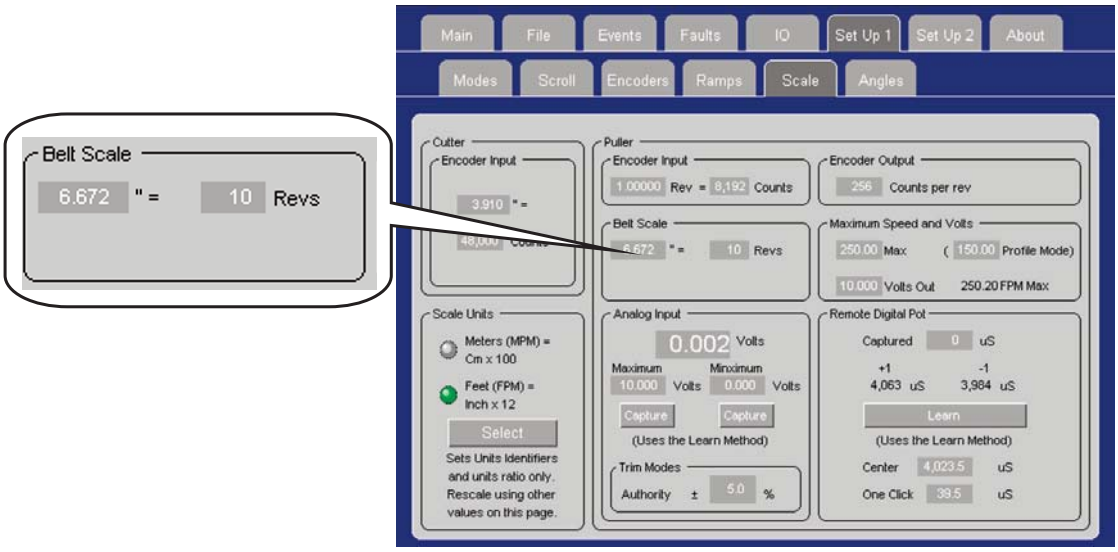
2 **Key in the counts per revolution amount.** This is the counts per revolution the puller's encoder output will make.

3 **Then press "Enter".** The pop-up keyboard is removed.

✎ **NOTE:** For applications that do not have the Profile/Bump/Taper mode any value may be set.

Scale Page Description (continued)

Puller - Belt Scale



The puller Belt Scale section is used to define the distance the belt moves after the motor has rotated a set number of revolutions. In this example, using a 16:1 gearbox will move the belt 6.672 inches every 10 revolutions of the puller's motor.

Belt Scale can be determined by comparing the set cut length of a product to the actual length produced. If the two measurements are not equal, the belt scale will need to be corrected.

To correct Belt Scale Length, divide the set length by the actual length of the product to find the error ratio. Multiply the Belt Scale length by the error ratio, the result is the new Belt Scale Length.

NOTICE: Belt Scale is affected by Belt Gap, belt material and heating and cooling of the belt material.

To change the Belt Scale Length:

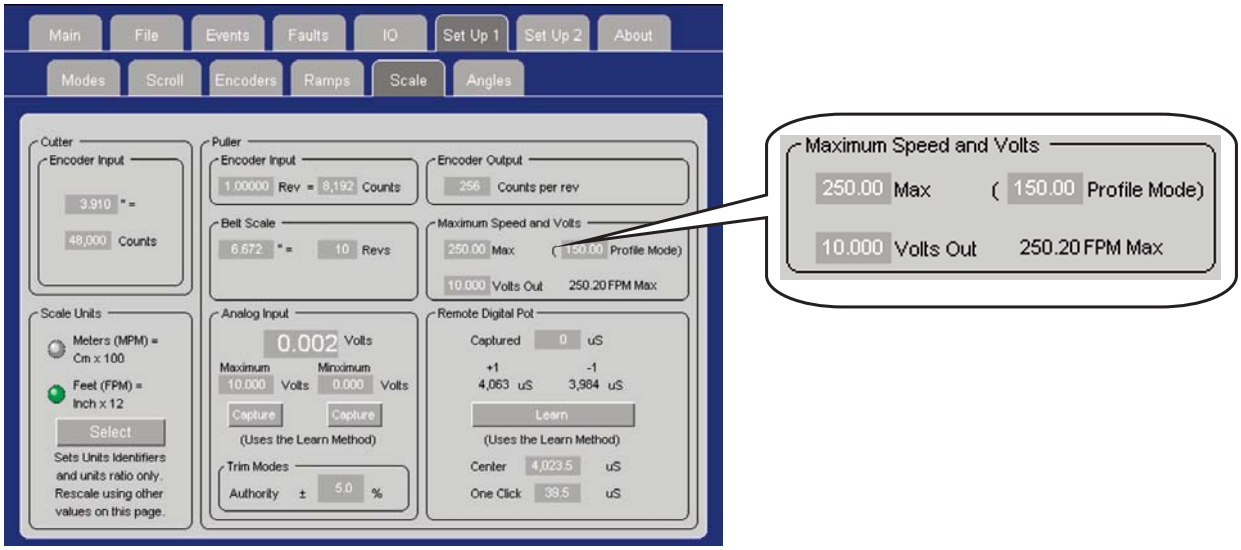
1 **Press the Puller section's Belt Scale Length window.** A numeric pop-up keyboard appears.

2 **Key in the new belt length.** This is the new Belt Scale Length that was confirmed by dividing the actual and set cut lengths and multiplying their result by the old Belt Scale Length.

3 **Then press "Enter".** The pop-up keyboard is removed.

Scale Page Description (continued)

Maximum Speed and Volts



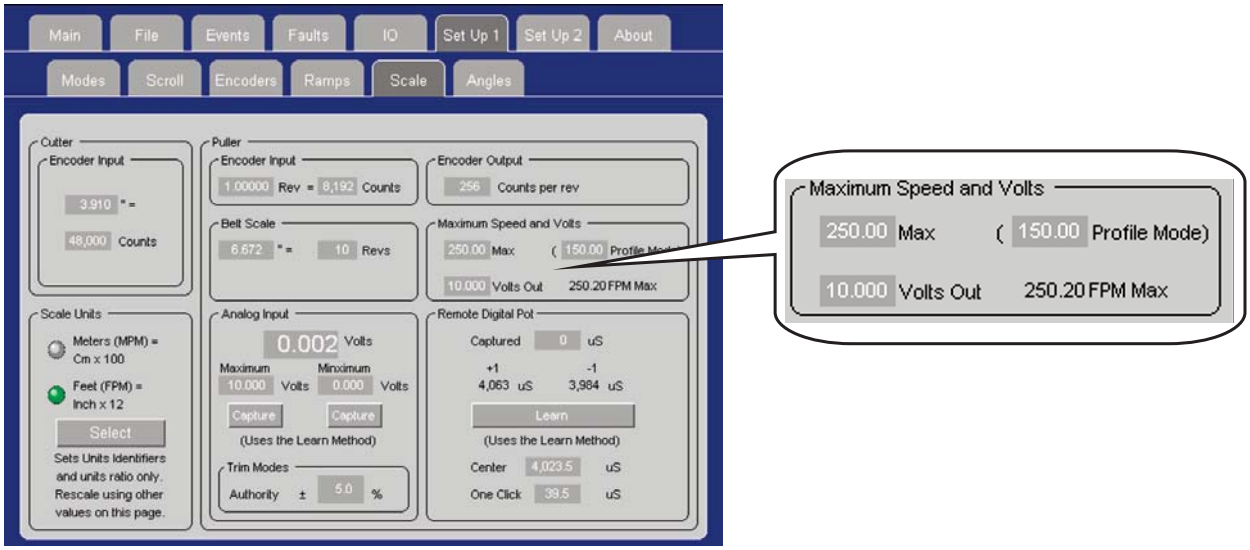
Maximum Speed and Volts settings are used to set the maximum speed of the puller. The puller can be limited to any speed up to the absolute maximum speed shown in the FPM Max window. It is not possible to set a speed higher than Set FPM Max. A separate maximum is available for the Profile/Bubble/Taper Mode, maximum FPM for this mode is typically less than for other modes.

A processor calculates the maximum speed that the puller can make based on the Belt Scale that is entered and details it has for the motor. The result is shown as absolute FPM Max.

(continued)

Scale Page Description

Maximum Speed and Volts (continued)



To set maximum puller speed:

1 **Press the Puller section's Maximum Speed and Velocity, Max window.** A numeric pop-up keyboard appears.

2 **Key in the new maximum speed.** This is the new FPM the puller will be limited to when producing product.

3 **Then press "Enter".** The pop-up keyboard is removed.

To set maximum Profile/Bubble/Taper Mode puller speed:

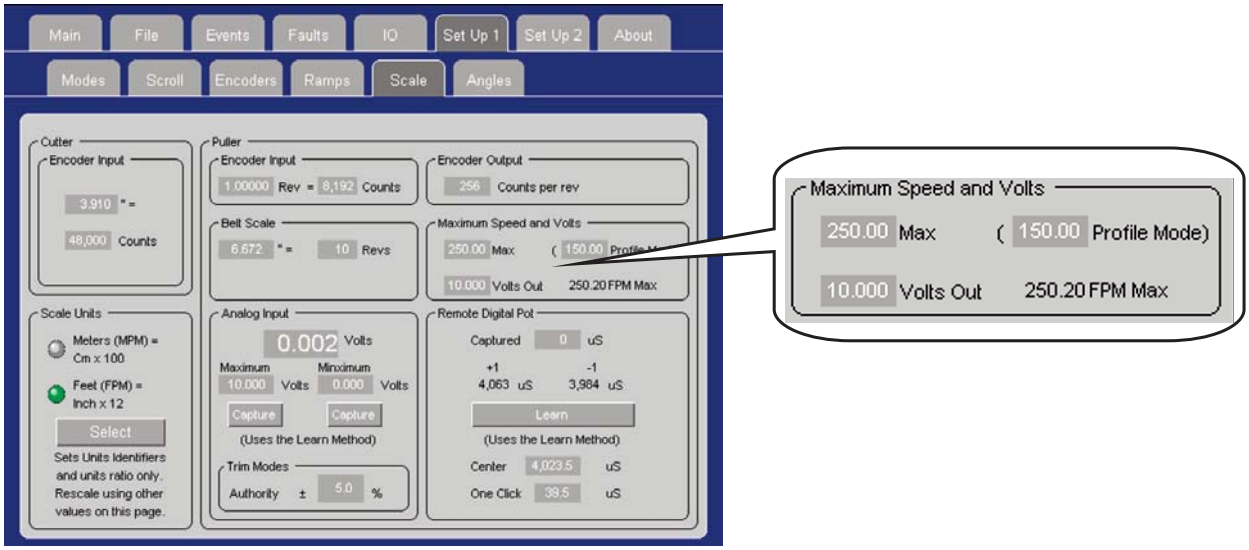
1 **Press the Puller section's Maximum Speed and Velocity, Profile Mode window.** A numeric pop-up keyboard appears.

2 **Key in the new Profile Mode FPM maximum speed.** This is the new FPM the puller will be limited to when producing product in Profile/Bubble/Taper Mode.

3 **Then press "Enter".** The pop-up keyboard is removed.

(continued)

Scale Page Description
Maximum Speed and Volts (continued)



An analog output is available that can be used to remotely monitor the puller speed. In the example 250 FPM will generate 10 volts DC.

To set the voltage output:

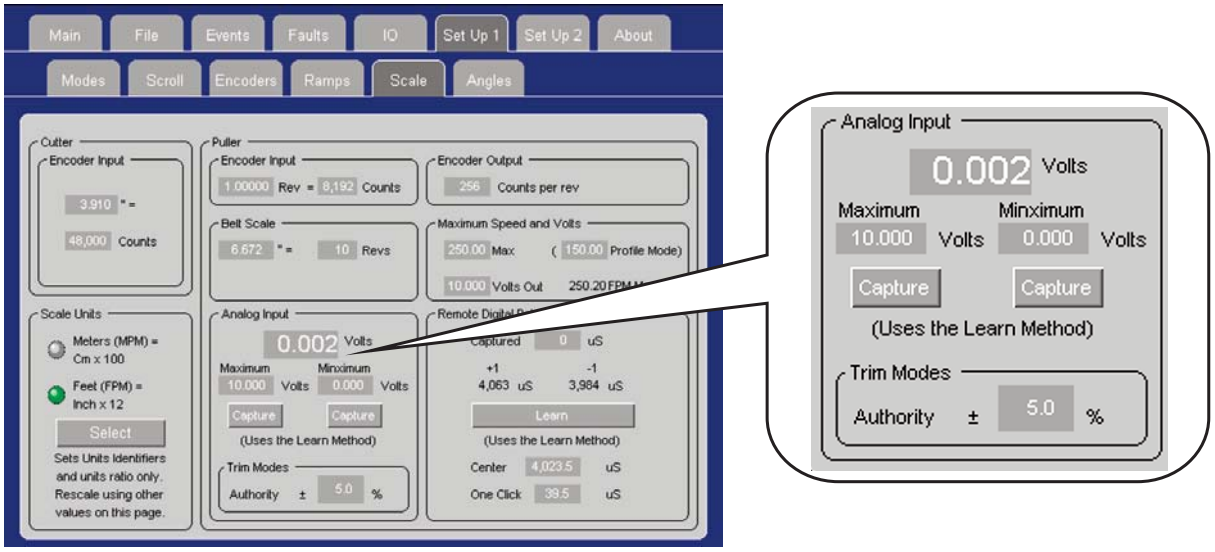
1 **Press the Puller section's Maximum Speed and Velocity, Volts Out window.** A numeric pop-up keyboard appears.

2 **Key in the new Volts Out amount.** This amount is dependent on the type of puller that is used and its set speed (FPM), which will determine the amount of volts that are produced.

3 **Then press "Enter".** The pop-up keyboard is removed.

Scale Page Description (continued)

Analog Input



A balanced analog input is provided at the 44-pin 'D' connector of the puller drive. A voltage may be applied here up to ±10 volts that is used for puller speed corrections. The value is shown in large characters on the Scale Page that is within the Analog Input window. This readout acts as a voltmeter and is Read Only. If the maximum and minimum voltages of the analog input are known they may be entered in the maximum and minimum presets in this section.

To set set the Maximum and Minimum Volts setting:

1 **Press the Puller section's Analog Input, Maximum or Minimum window.** A numeric pop-up keyboard appears.

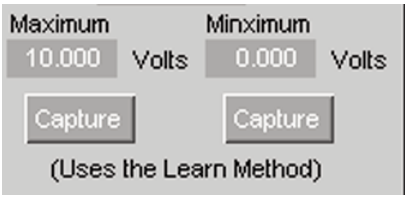
2 **Key in the new voltage.** The voltage can not be set above 10 volts for the Maximum Volts setting.

3 **Then press "Enter".** The pop-up keyboard is removed.

In Analog mode it is typical to have the speed range controlled by zero to 10 volts.

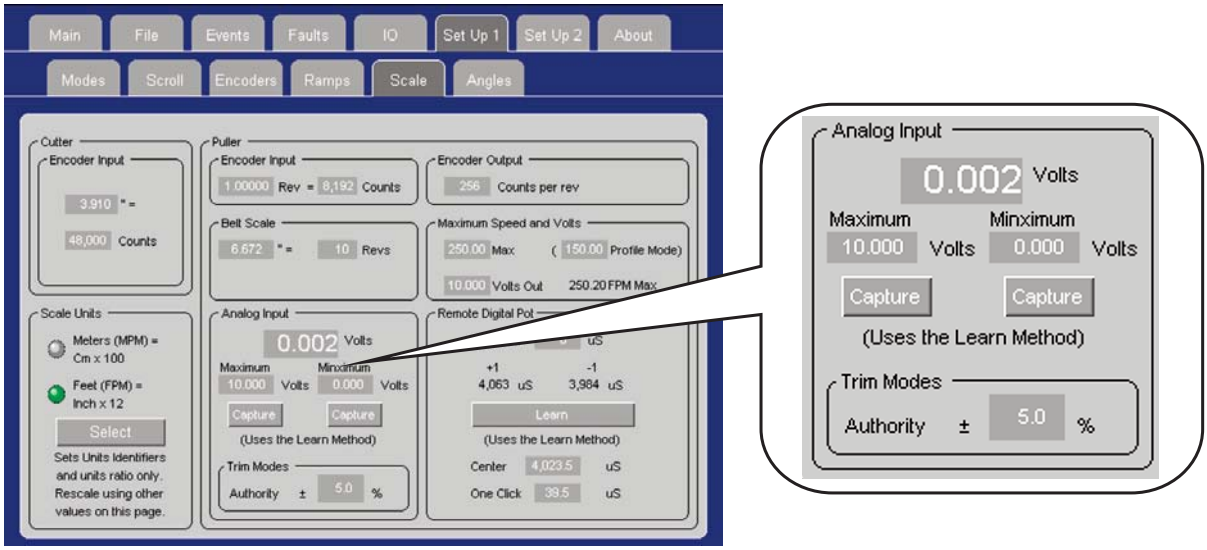
Learn Method

A Learn method is also available that allows the maximum and minimum voltages to be entered by the pressing the "Capture" button. To learn the maximum voltage, press the "Capture" button that is beneath the Maximum Volts preset. Follow the same procedure to learn the Minimum Volts.



Scale Page Description (continued)

Trim Modes - Authority



In Trim Modes, it is typical to set Maximum voltage to 10 volts and Minimum Voltage to 5 volts. 5 volts would then be the middle point of the scale where no speed correction would be necessary. With this scaling 10 volts would provide the maximum speed increase and 0 volts would provide the maximum speed decrease, 5 volts would have no effect.

Trim Modes-Authority is the percentage of change to the set speed that the analog input can make. For example, if you set the Maximum Volts for 10 volts and the Minimum Volts for 5 volts and then set the Trim Modes-Authority for 10%, 10 volts would adjust the puller to run 10% faster than its set speed and 0 volts would adjust to puller to run 10% slower than its set speed.

To set Trim Modes-Authority scaling:

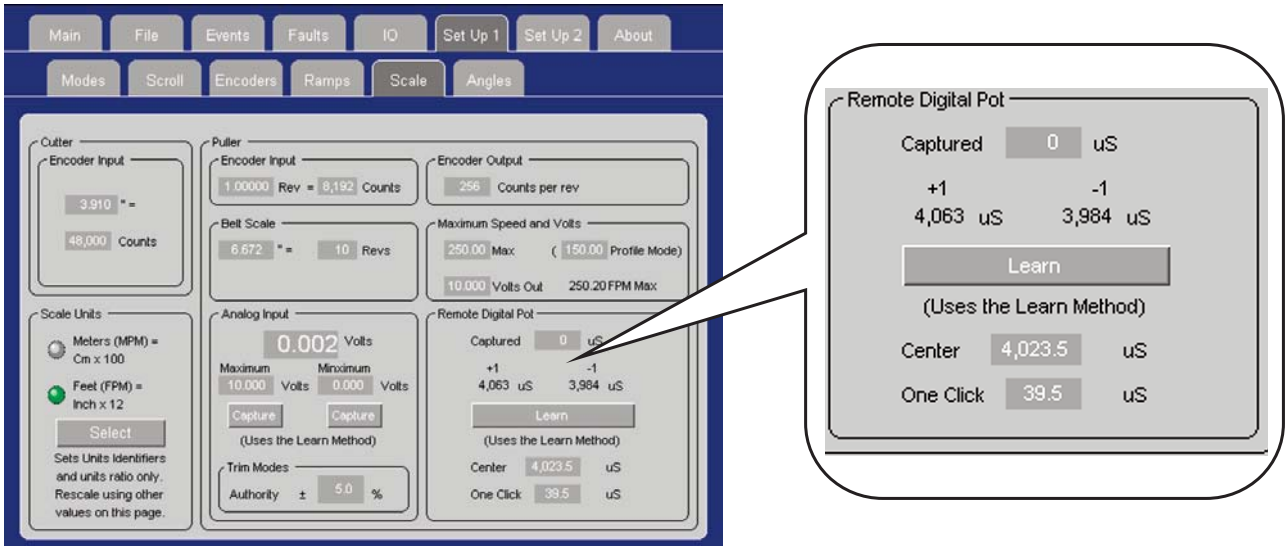
1 **Press the Puller section's Analog Input, Trim Modes-Authority window.** A numeric pop-up keyboard appears.

2 **Key in the Trim Modes - Authority.** The value set here is the maximum effect the analog input may have on the puller's set speed.

3 **Then press "Enter".** The pop-up keyboard is removed.

Scale Page Description (continued)

Remote Digital Potentiometer



The Remote Digital Potentiometer uses a 4-millisecond wide carrier pulse. The pulse width is modified by clicks of the potentiometer's rotary dial. Positive rotations add 40 microseconds per click. Negative rotations subtract 40 microseconds per click.

Calibrations can be made by using the Learn feature. For calibration, it is necessary to "learn" the time for one click clockwise and one click counterclockwise. The "Learn" button automatically places the results in the proper box.

- **Center** - is the average time between rotating the potentiometer's rotary dial clockwise one click (+1) and counterclockwise (-1) one click. This value can be found by taking the average of both numbers.

- **One Click** - is result of the (-1) captured counterclockwise rotation of the potentiometer's rotary dial subtracted from the "Center" measurement.

To set Center and One Click scaling:

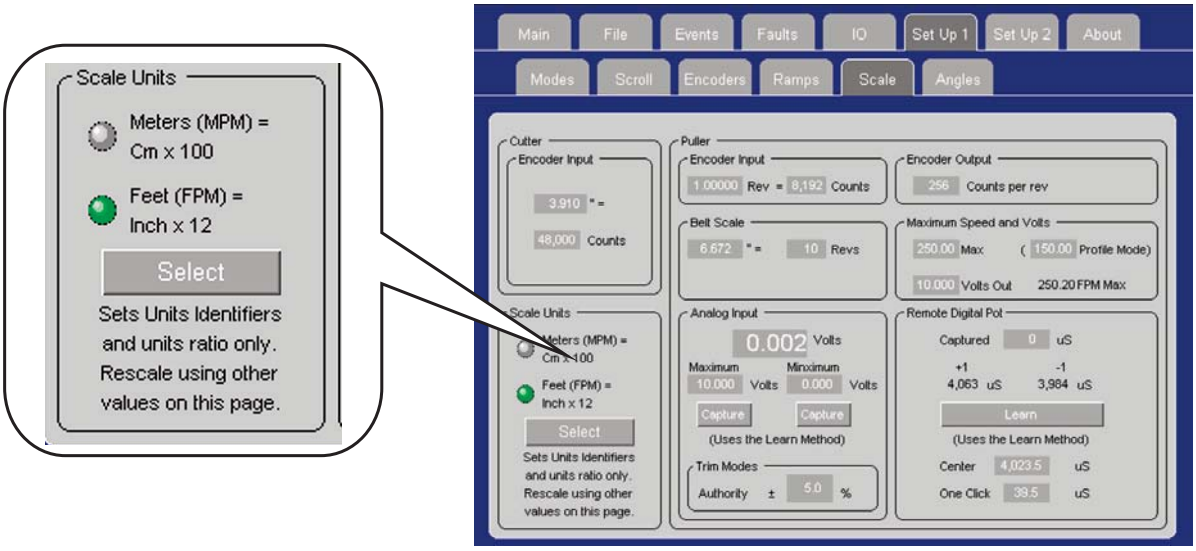
1 **Press the Puller section's Remote Digital Pot or Center window.** A numeric pop-up keyboard appears.

2 **Key in the new scaling amount.**

3 **Then press "Enter".** The pop-up keyboard is removed.

Scale Page Description (continued)

Scale Units

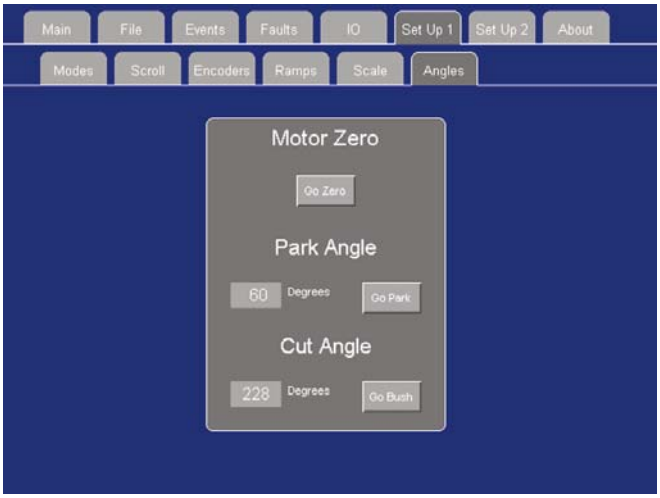


Scale Units changes the measurements identifiers and speed/distance ratios for all pages. The setting DOES NOT switch measurements from English to Metric. Scaling measurements will need to be converted when switching between English and Metric.

To set Scale Units:

1 **Press the Cutter section's Scale Units, "Select" toggle button.** This will change all measurements from English to Metric or Metric to English. A green light will illuminate next to the current selection.

Angles Page Description



To access the Angles Page:

1 Press the Set Up 1 tab.

2 Press the Angles sub-tab.

Positional servomotors will require a reference point. This position is known as Home or Zero. On a cutter the Home reference must occur at one point within the 360-degree turn of the blade arm.

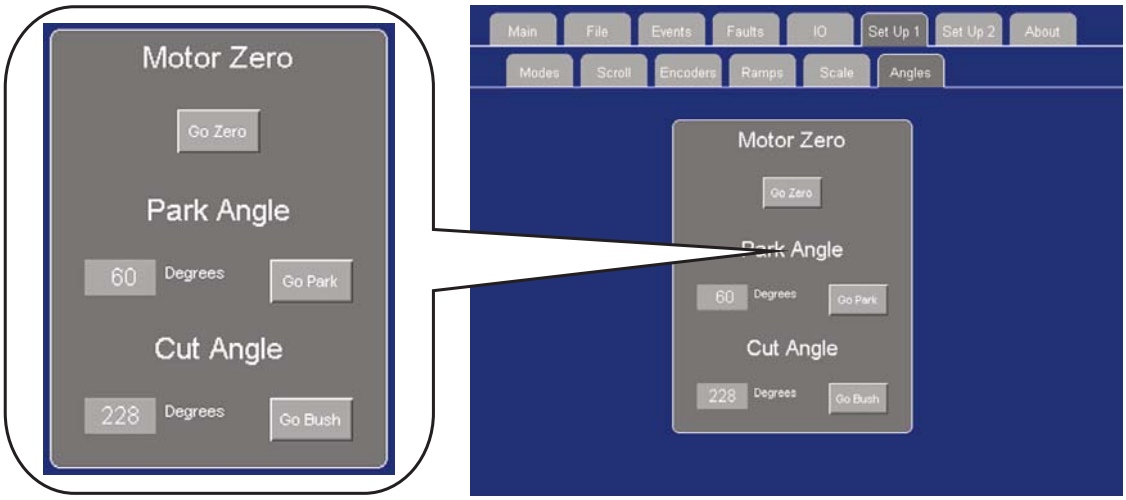
- **Reducer** - If the motor has a gear reducer, a proximity sensor is used to detect a target (usually a bolt) that is mounted on the blade arm.
- **No Reducer** - The internal zero marker that is built into the motor is used.

To position the servomotor to Zero or "Home":

1 Press the "Go Zero" button to place the cutter arm in the Zero or "Home" position.

Angles Page Description (continued)

Park Angle



Park Angle is the place to park the blade. It is typical to park the blade 60 to 180 degrees before the cut angle. Acceleration can be checked on the Ramps Page using the Calculations at the bottom of the page to ensure blade can reach speed in the angle provided. *See Operation Section entitled, Ramps Page Description, Calculations.*

To change the Park Angle:

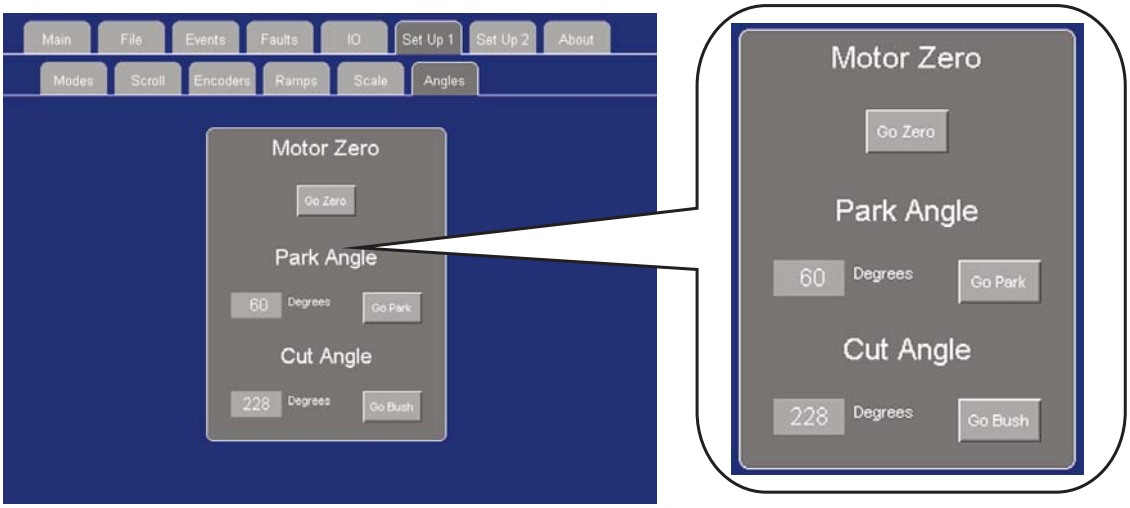
1. **Press the Park Angle Degree window.** A numeric pop-up keyboard appears.
2. **Key in the new Park Angle.** Ensure that the distance from the Park Angle to the Cut Angle allows the cutter blade to reach its required speed before it enters the material to be cut.
3. **Then press "Enter".** The pop-up keyboard is removed.
4. **The Park Angle will appear in the Park Angle window and will then be active.**

To check the Park Angle:

1. **Press the Park Angle "Go Park" button.** This will rotate the cutter blade to the degree entered at the Park Angle Degree window. The cutter must be stopped but enabled for these buttons to function. The puller provides a "Cutter Drive Enable" when it is running.

Angles Page Description (continued)

Cut Angle



Cut Angle is the position where the blade is in the cutter bushing. The center of the bushing or blade just entering the bushing can be used.

This position is used for captures used in the Follower mode and for Repeatability testing.

To change the Cut Angle:

1 **Press the Cut Angle Degree window.** A numeric pop-up keyboard appears.

2 **Key in the new Cut Angle.** Ensure that the distance from the Park Angle to the Cut Angle allows the cutter blade to reach its required speed before it enters the material to be cut. *See Operation Section entitled, Ramps Page Description, Calculations.*

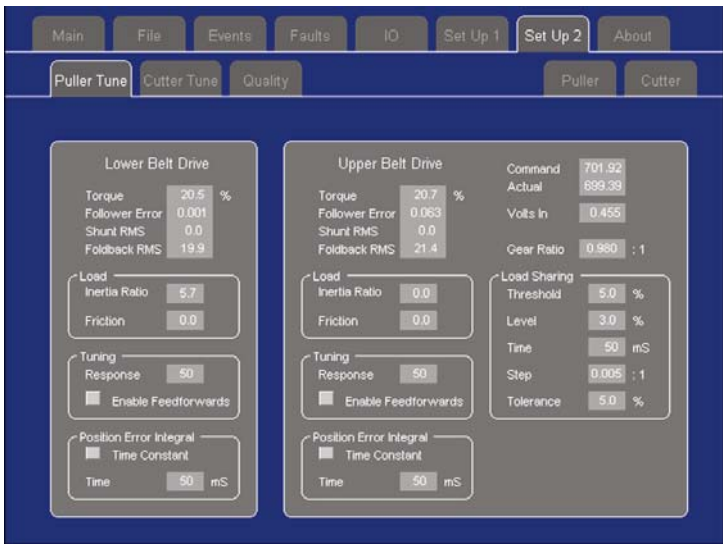
3 **Then press "Enter".** The pop-up keyboard is removed.

4 **The Cut Angle will appear in the Cut Angle window.**

To check the Cut Angle:

1 **Press the Cut Angle "Go Bush" button.** This will rotate the cutter blade to the degree entered at the Cut Angle Degree window. The cutter must be stopped but enabled for these buttons to function. The puller provides a "Cutter Drive Enable" when it is running.

Set Up 2 Page Description



The Set Up 2 folder contains the following five pages.

- Puller Tune
- Cutter Tune
- Quality
- Puller (Factory)
- Cutter (Factory)

To access the Puller Tune Page:

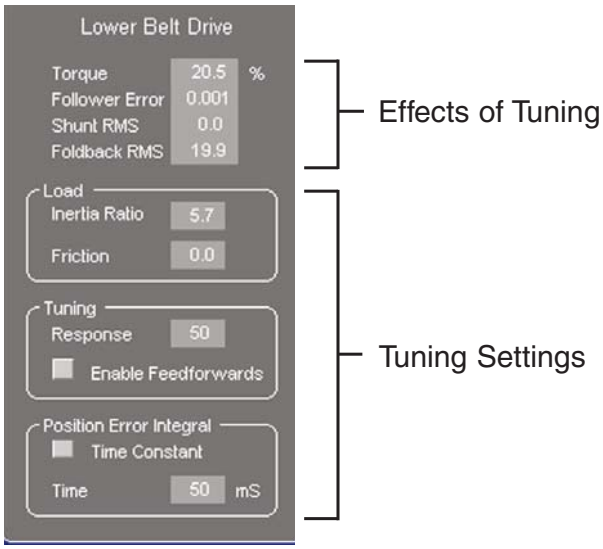
1 Press the Set Up 2 tab.

2 Press the Puller Tune sub-tab.

Set Up 2 Page Description (continued)

Tuning the Belt Drive

Both the puller and cutter drives have a set of presets with similar functions. A description for any parameter in this section applies to all drives. *Please refer to Control Techniques documentation for additional information and setting descriptions.*



NOTE: All values can be changed by pressing individual windows and using the keyboard method to alter the value. *See Setting the Cutter Length, Keyboard Method.*

Common Tuning Controls

There are four values and two check boxes that are used to tune each puller drive (Upper and Lower). These values are Inertia Ratio, Friction, Response and Time Constant. Check boxes to enable Feedforwards and Time Constant are provided. *Please refer to Control Techniques documentation for additional information and setting descriptions for Inertia Ratio, Friction Response and Time Constant.*

The four values in the top section are Torque, Follower Error, Shunt and Foldback. These values are read-only and help to show the effects of tuning.

NOTE: If a drive is too tightly tuned it will be more accurate but may consume more power, an under-tuned drive will use less power but it will not be as accurate.

(continued)

Set Up 2 Page Description (continued)

Tuning the Belt Drive

Upper Belt - Additional Controls

The control for the upper belt includes additional controls that are there to help balance the load between the two belts. Since motors, gear boxes and belts are similar it is expected that gear ratio should always be 1.000:1. However, there are always mechanical differences. If these are not compensated for one drive will end up pulling the entire load and the other will act as a brake. The system here attempts to keep a 1:1 gear ratio but checks the torque for each puller drive and modifies gear ratio in order to keep the torque similar.

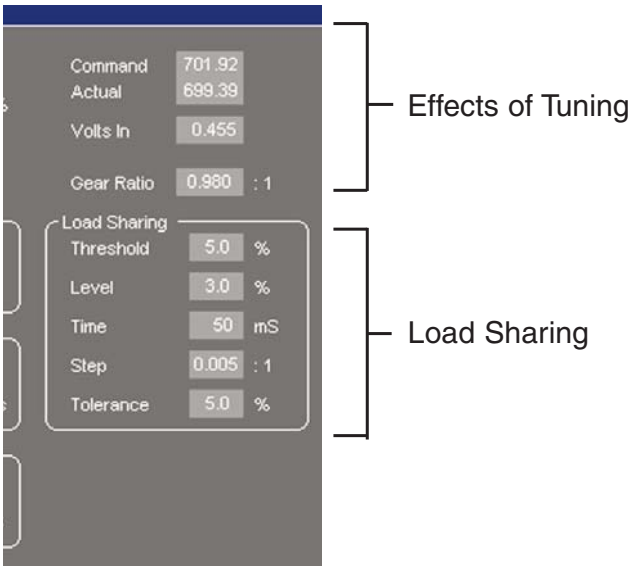
Adjustments that provide load sharing are at the lower section of the control display. The read-only values are at the top section of the control.

Effects of Tuning:

- **Command & Actual** - These values show the commanded and actual RPM's for the belt drive motor.

- **Volts In** - The upper belt drive obtains the torque from the lower belt drive as an analog value. This is shown as Volts in.

- **Gear Ratio** - The Gear Ratio should be close to 1.000:1 for a balanced load. This value should be allowed to change. It is recommended that this stays within a maximum variance of 1%.



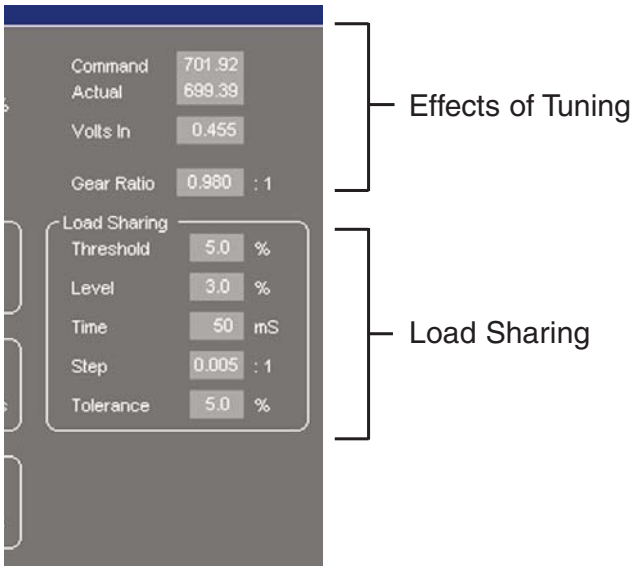
Upper Drive - Torque share parameters

(continued)

NOTE: All values under "Load Sharing" can be changed by pressing individual windows and using the keyboard method to alter the value. *See Operation Section entitled Setting the Cutter Length Scroll and Keyboard Methods.* Results can be viewed in the Effects of Tuning portion of each section.

Set Up 2 Page Description

Tuning the Belt Drive (continued)



Load Sharing:

- **Threshold** - Each drive must exceed the set value before the program begins to make adjustments.

- **Level** - Once both drives exceed the Threshold the Level of difference is checked next. If the difference is great enough the Top Belt must either increase or decrease ratio.

- **Time** - Updates to the belt drive will occur at this time interval.

- **Step** - This setting controls the change that will be made to the Gear Ratio.

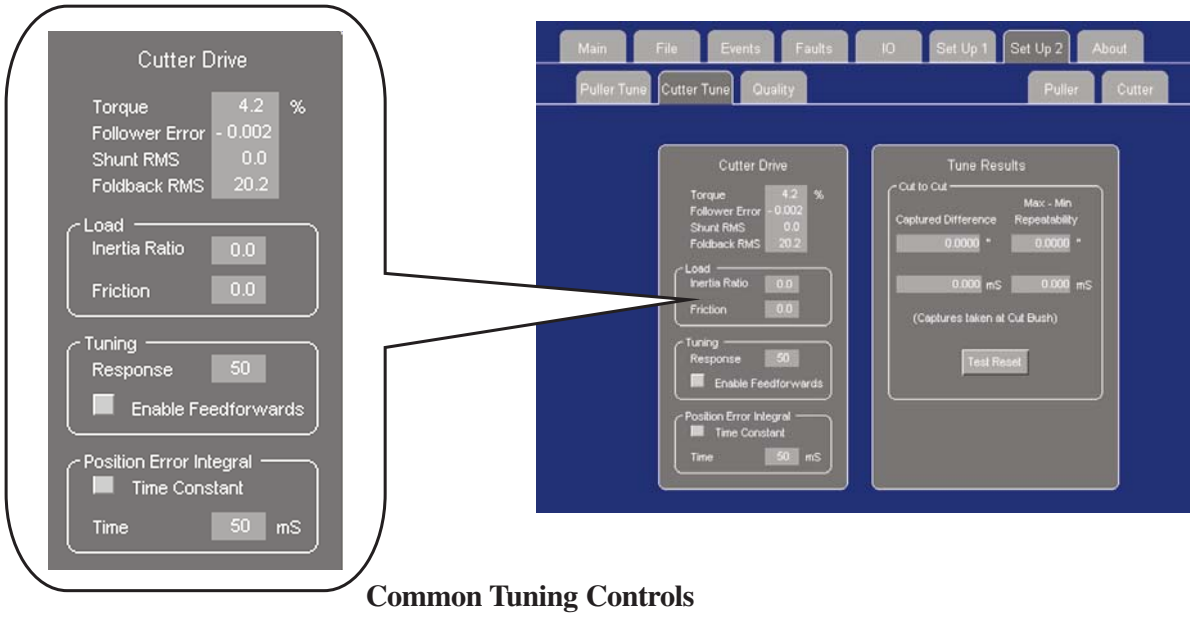
- **Tolerance** - This is the maximum variation that is allowed. Gear Ratio should vary only slightly when set correctly.

✎ **NOTE:** All values under "Load Sharing" can be changed by pressing individual windows and using the keyboard method to alter the value. *See Operation Section entitled Setting the Cutter Length Scroll and Keyboard Methods.* Results can be viewed in the Effects of Tuning portion of each section.

Set Up 2 Page Description (continued)

Tuning the Cutter

The right-hand side of the Cutter Tune page is used to test repeatability. The tester is permanently enabled. “Test Reset” may be pressed at any time to begin a fresh test. For example, after changing any tune value the test may be reset to begin a fresh test. Repeatability is shown in length and time formats. Length is the most important. However, if time is fluctuating excessively this could indicate poor puller or cutter repeatability.



Common Tuning Controls

There are four values and two check boxes that are used to tune the cutter drive . These values are Inertia Ratio, Friction, Response and Time Constant. Check boxes to enable Feedforwards and Time Constant are provided. *Please refer to Control Techniques documentation for additional information and setting descriptions for Inertia Ratio, Friction Response and Time Constant.*

The four values in the top section are Torque, Follower Error, Shunt and Foldback. These values are read-only and help to show the effects of tuning.

Cutter Drive - Tune Results / Repeatability

To access the Cutter Tune Page:

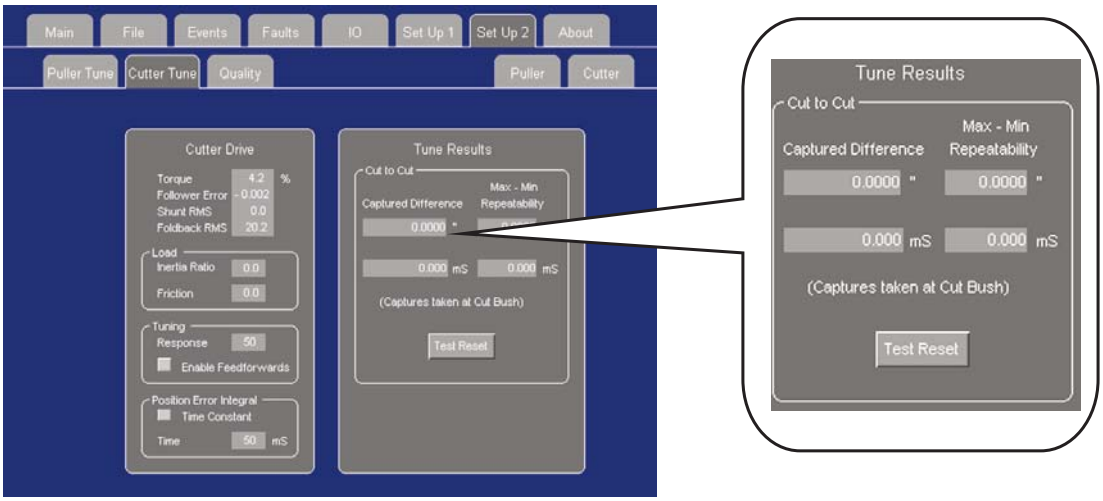
1 Press the Set Up 2 tab.

2 Press the Cutter Tune sub-tab.

(continued)

Set Up 2 Page Description

Tuning the Cutter (continued)

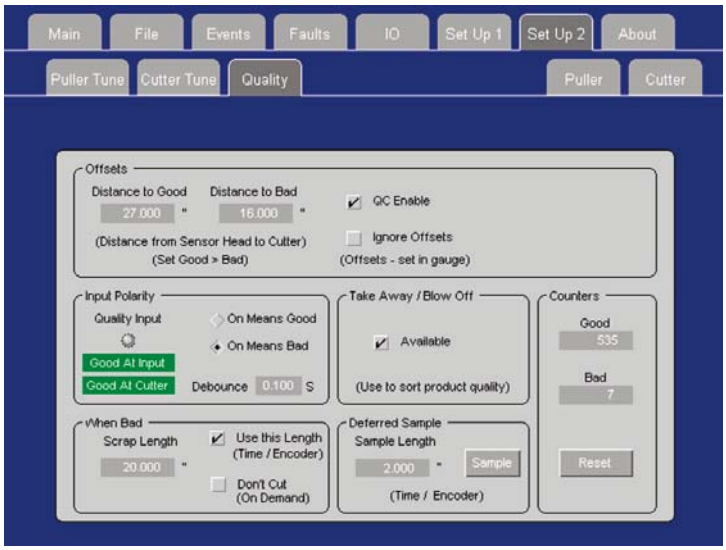


- **Captured Difference** - shows the length that the drive captures each time the blade enters the cutter bushing. It should match the set length very closely. However, this test cannot factor in slippage or shrinkage of the product.

- **Max-Min Repeatability** - This value is the difference between the maximum and minimum values that were captured by Captured Differences. If any tune values are changed, press the "Test Reset" button to begin a new Repeatability Test.

Quality Page Description

Offsets

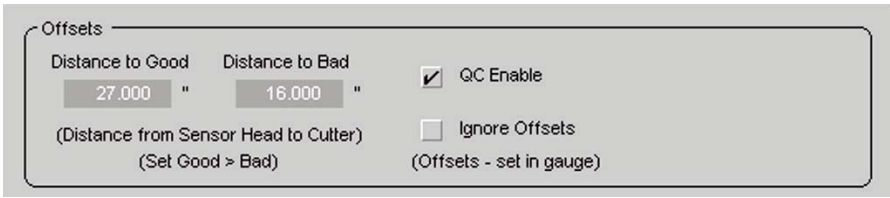


Quality is used with a product measurement control. A laser or ultrasonic gauge is mounted upstream of the cutter and used to monitor the product. This may check size, wall thickness and defects. While product is Good it sets an output to a state that means good. The output will change to Bad for out of tolerance product.

To access the Quality Page:

1 Press the Set Up 2 tab.

2 Press the Quality sub-tab.

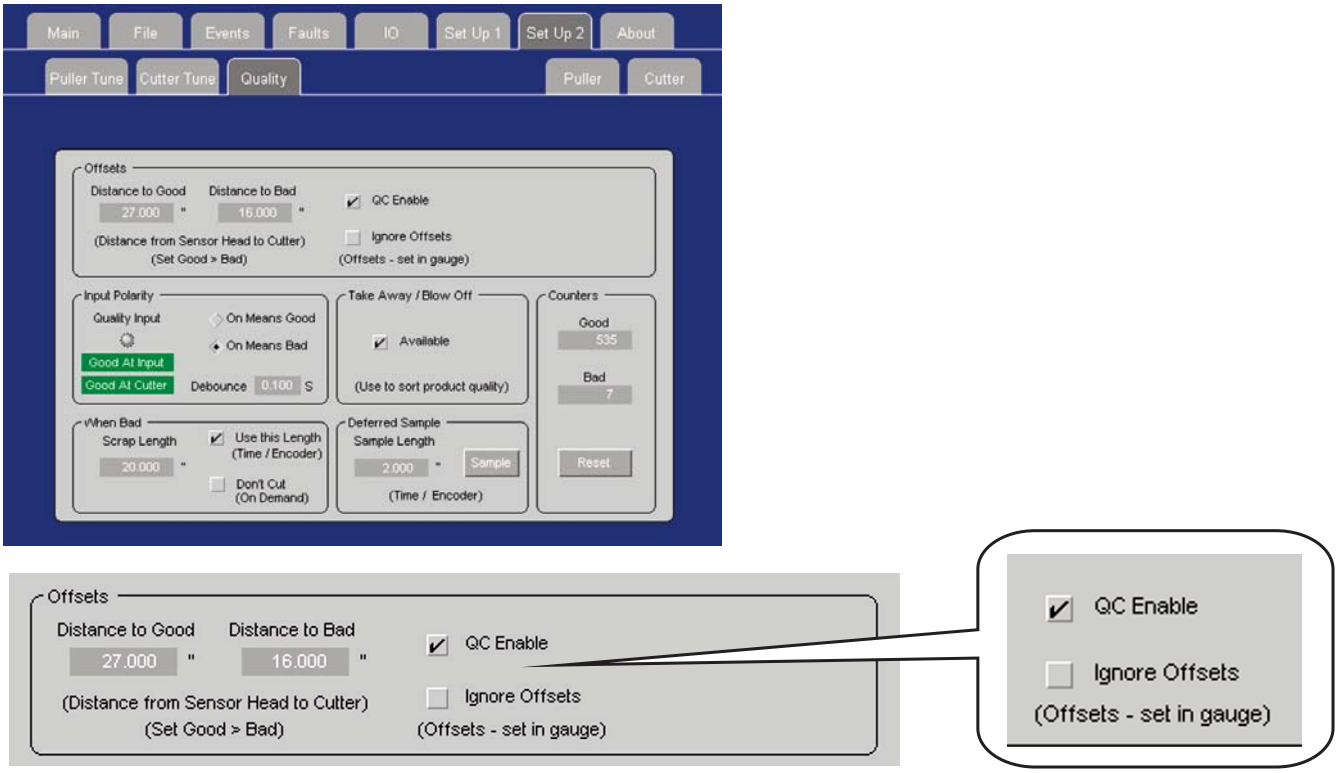


Some gauges delay their good/bad output by using programmed offsets. The cutter also has this ability. Two values can be entered. These are the distance from gauge to cutter plus and minus an overlap. Distance to Good is the distance between the gauge and cutter plus an extra distance to ensure the out of tolerance section has been cleared of the product line. Distance to Bad should be set less than the distance between gauge and cutter to ensure product is treated as bad sooner.

(continued)

Quality Page Description

Offsets (continued)



When using offsets with the cutter the "Distance to Good" length should be set higher than the "Distance to Bad" length. If the values are not set correctly a warning message will be displayed.

To adjust the "Distance to Good" and Distance to Bad" length:

1 **Press the Distance to Good or Distance to Bad window.** A numeric pop-up keyboard appears.

2 **Key in the new length amount.** Ensure that the "Distance to Good" length is set higher than the "Distance to Bad" length.

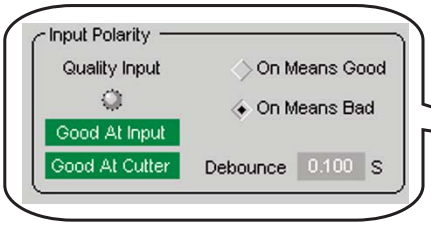
3 **Press "Enter".** The pop-up keyboard is removed.

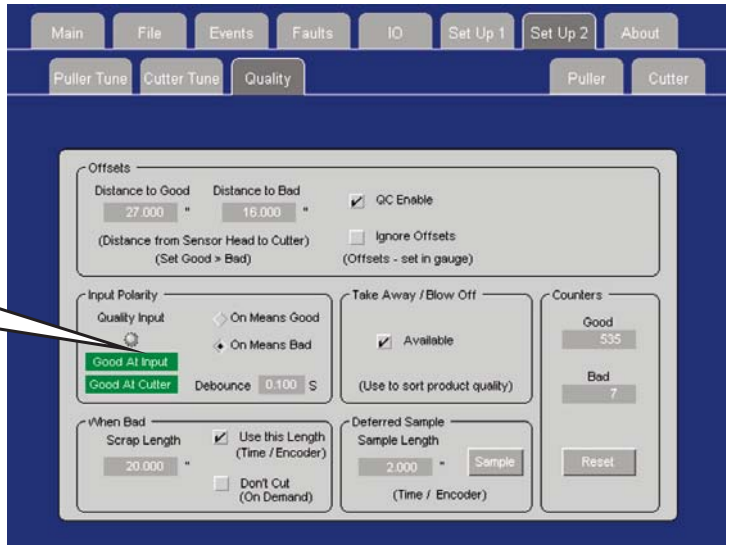
- **QC Enable -** Should be checked when Quality Control is in use. Leave the QC Enable uncheck if Quality Control is not used.

- **Ignore Offsets -** Should be checked if offsets are set in the remote gauge. This option causes the offset presets on this page to be ignored.

Quality Page Description (continued)

Input Polarity





Radio buttons are available to choose the meaning of the quality input. Options are “On Means Good” and “On Means Bad”.

To change the meaning of the quality input:

1 Press either ”On Means Good” or On Means Bad”. A dot will appear in the radio button of the selected quality input type.

An active input can be set to mean Good or Bad. This section includes an indicator to show the state of the input with the meaning of this state shown underneath. Messages will read “Good at Input” or Bad at Input” The green window will change to red when “Bad at Input” is displayed. When Quality Control is enabled the offsets used with the cutter will affect the second message “Good at Cutter” or “Bad at Cutter”. These messages are also color-coded. A green background will be displayed when “Good at Cutter” is shown and a red background will be displayed when “Bad at Cutter” is shown.

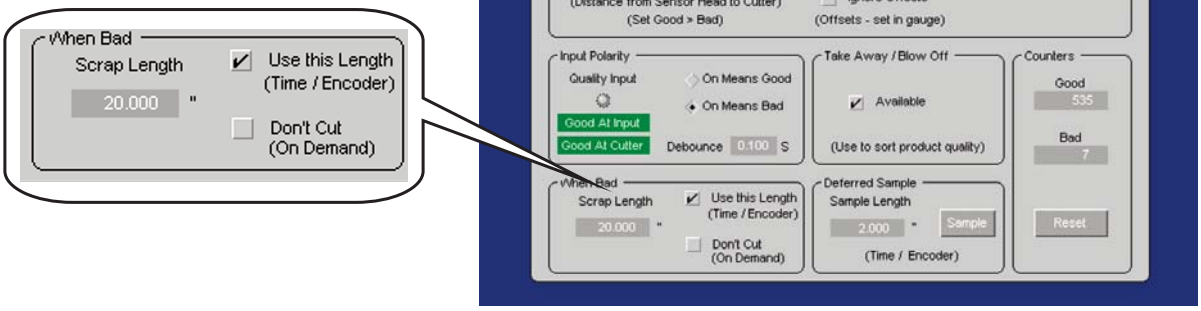
NOTE: The Debounce value can be changed by pressing its individual windows and using the keyboard method to alter the value. *See Operation Section entitled Setting the Cutter Length Scroll and Keyboard Methods.*

Debounce

This filter is used with the Good/Bad input. A setting of “0” should be used when using an input source that is transistorized. If the input is a volt-free relay contact then Debounce filter can be used. Relay contacts “bounce” their signal when they turn on and off. When not filtered correctly they can confuse the sensors that capture their position. A typical setting for a relay contact filter is 0.050 seconds.

Quality Page Description (continued)

When Bad



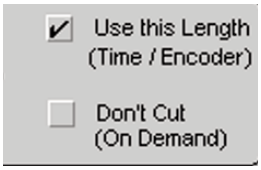
The Scrap Length setting can be set and used to remove product that has been produced and determined that it was bad by Quality Control. *See Operation Section entitled, Quality Page Description, Offsets.* This setting is available for Time and Encoder Modes. The scrap length should be set twice as long as good lengths to help differentiate them from one another.

To adjust the Scrap Length:

1 **Press the Scrap Length window.** A numeric pop-up keyboard appears.

2 **Key in the new length amount.** Ensure that the Scrap Length is set at least twice as long as lengths that are good.

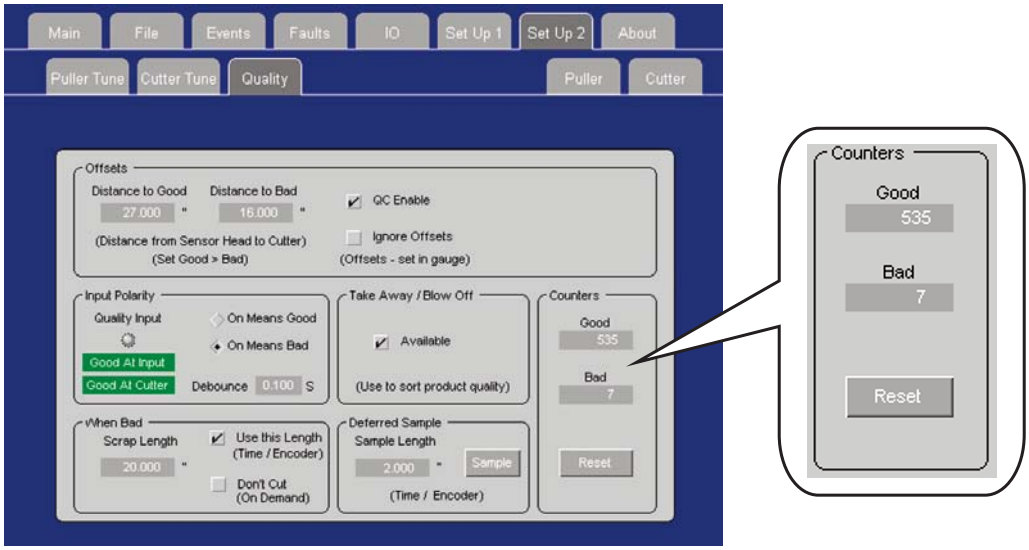
3 **Press "Enter".** The pop-up keyboard is removed.



- **Use this Length -** The "Use this Length" check box should be checked when the entered scrap length is required. If left unchecked, the scrap length will be the length set on the Main Page Cut Length window.

- **Don't Cut -** Check the "Don't Cut" check box if the cutter should stop cutting for bad product.

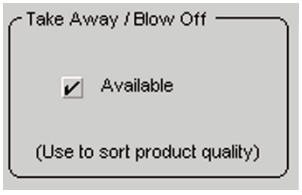
Quality Page Description (continued)



NOTE: The Deferred Sample Length can be changed by pressing its individual windows and using the keyboard method to alter the value. *See Operation Section entitled Setting the Cutter Length Scroll and Keyboard Methods.*

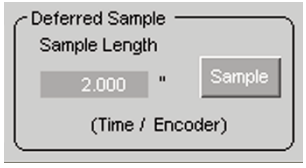
Counters

Good and Bad counters are provided. The Good counter will only count product that has been labeled good at the cutter and the Bad counter will only count product that has been labeled bad at the cutter. Press the "Reset" button to reset both counts together. The counters will only be used when the Quality Control is enabled.



Take Away/Blow Off

Check the Available check box when using a Take Away/Blow Off Conveyor. When the box is checked the Total and Batch counters increase when good pieces are blown off the conveyor not when they are cut at the Combination Puller/Cutter. *See Operation Section, Main Page Description, Configuring Blow Off Settings.*



Deferred Sample

This feature is only for the Time and Encoder Modes. It is used to obtain a set sample length for quality assurance. Pressing the "Sample" button will provide one additional cut within the product for the sample. This sample length will be inserted in between the normal cut sequence. For example, if cut lengths are set to 12 inches and sample is set to 2 inches there will be one 2 inch length produced after pressing the "Sample" button. This will be inserted after the next 12 inch cut is made. The sample length is a user preference.

Factory Pages Description

The Puller and Cutter sub-tabs located within the Set Up 2 folder are for factory personnel only. Information contained on these pages will not be mentioned in this manual.

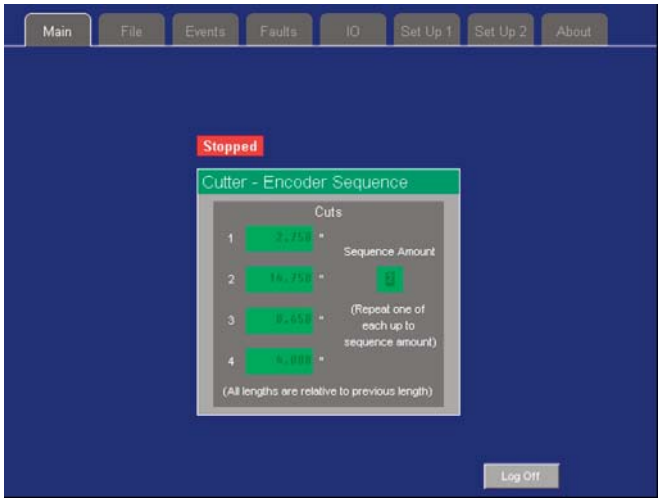
About Page Description

Press the “About” tab to show contact details for The Conair Group. The About page appears as a pop-up in the center of the screen. A software version number will appear here whenever changes or upgrades are made.

Press the “Exit” button to remove this pop-up.

Encoder Sequence Page Description

Encoder Sequence mode is a variation of Encoder mode that has up to four lengths. *See Operation Section entitled, Modes Page Description*.



A "Sequence Settings" button replaces the Length preset that appears on the Main Page when this mode is selected. *See Operation Section entitled, Configuring the Set Up 1 Folder, Selecting Modes.*

The four lengths and a Sequence Amount window are shown the main Encoder Sequence Page. In this example, Sequence Amount is set to 2 which means Lengths 1 and 2 will be produced alternatively. Lengths 3 and 4 in this example will not be produced.

To access the Encoder Sequence Main Sub-Page:

1 Press the Set Up 1 tab and then press the Modes sub-tab.

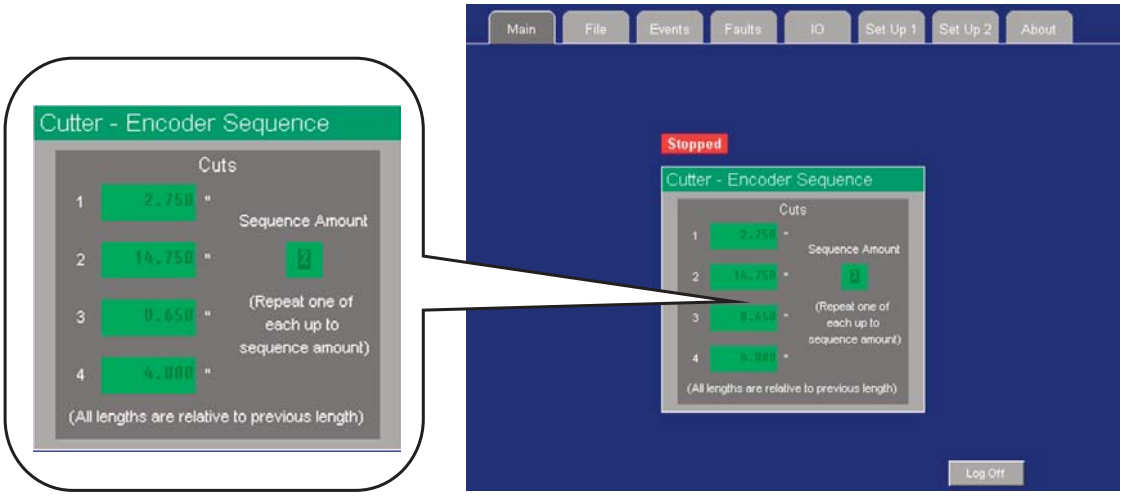
2 Select Encoder Sequence Mode for the cutter section. "Sequence" will be displayed at the bottom of the cutter section when selected properly.

3 Press the Main Page tab.

4 A "Sequence Settings" button will now be displayed in the cutter portion's length window.

5 Press the "Sequence Settings" button to access the Encoder Sequence Mode Main Sub-Page.

Encoder Sequence Page (continued)
Description
Setting Sequence Lengths



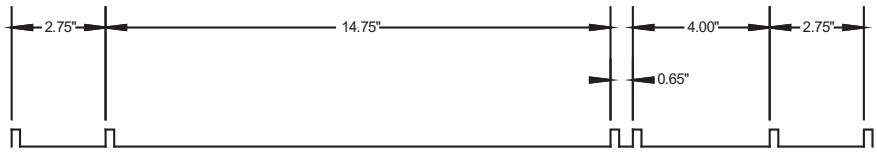
To activate and change cut lengths:

1 **Press the Sequence Amount window.** A pop-up keyboard appears, enter the amount of sequence cuts needed (1-4).

2 **Press "Enter".** The pop-up keyboard is removed. All length windows can be altered, but will only be used if they are selected with the Sequence Amount.

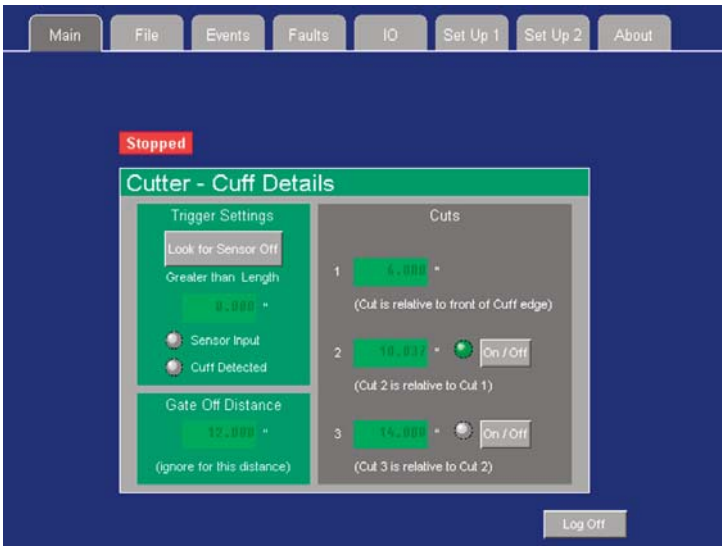
3 **Press the Cuts length window of the cuts to be used.** A pop-up keyboard appears.

4 **Press "Enter".** The pop-up keyboard is removed. Cut lengths will now be produced according to the cut sequence that has been set.



Encoder Sequence Sample with Sequence Amount set to 4

Cuff Page Description



Cuff is a special mode that is used for corrugated products that have a cuff section. Cuff Mode can also be used with printed products to synchronize cuts to marks that are printed on the product upstream of the cutter. The sensor detects the ink mark (image or text). *See Operation Section entitled, Modes Page Description*.

To access the Cuff Mode Sub-Page:

1 Press the Set Up 1 tab and then press the Modes sub-tab.

2 Select Cuff Mode for the cutter section. "Cuff Settings" will be displayed at the bottom of the cutter section when selected properly.

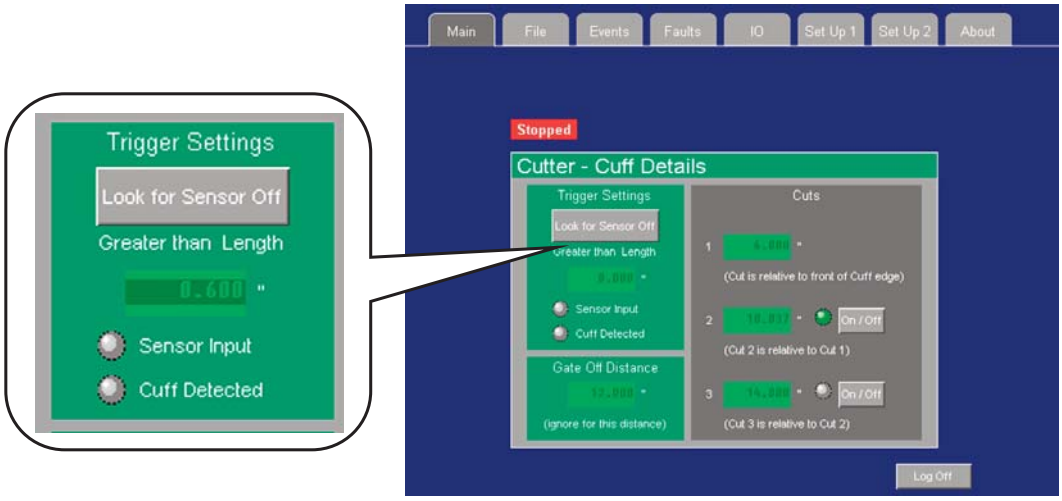
3 Press the Main Page tab.

4 A "Cuff Settings" button will now be displayed in the cutter portion's length window.

5 Press the "Cuff Settings" button to access the Cuff Mode Main Sub-Page.

Cuff Page Description (continued)

Trigger Settings



Trigger settings are used to define the Cuff shape. A length at a sustained level must be met in order for the section to be considered a Cuff. Choices for cuff detection are “Look for Sensor Off” or “Look for Sensor On”.

To change the Look for Sensor input sensor detection logic:

1 **Press the “Look for Sensor On/Off” button** to toggle the sensor’s input logic.

The cutter will be able to differentiate between a cuff and a corrugation by their lengths. Corrugations typically are shorter than Cuffs. The “Greater than Length” setting is used to set the distance the Trigger Settings sensor will wait until it has determined that it has detected a cuff.

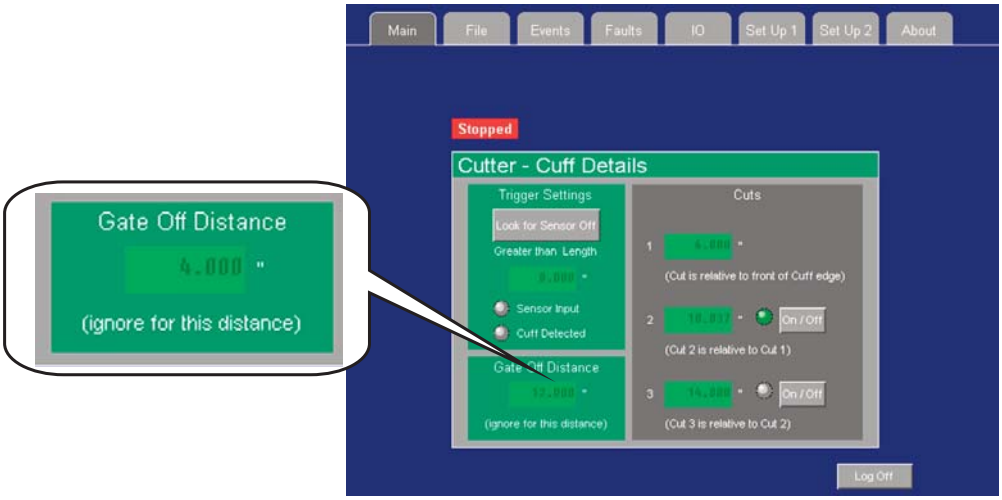
To set the “Greater than Length” setting:

1 **Press the Greater than Length window.** A pop-up keyboard appears, enter the new distance the Trigger setting will wait until it detects a cuff.

2 **Press “Enter”.** The pop-up keyboard is removed. The new “Greater than Length” will now be displayed.

Cuff Page Description (continued)

Gate Off Distance



Gate Off Distance is used to disable the sensor for the length set once a cuff has been detected. The length set should be less than the actual distance between cuff sections, this is so the Trigger Distance setting sensor will be active to detect the next cuff. Set lengths of 80 to 90% of the length between cuffs should be used.

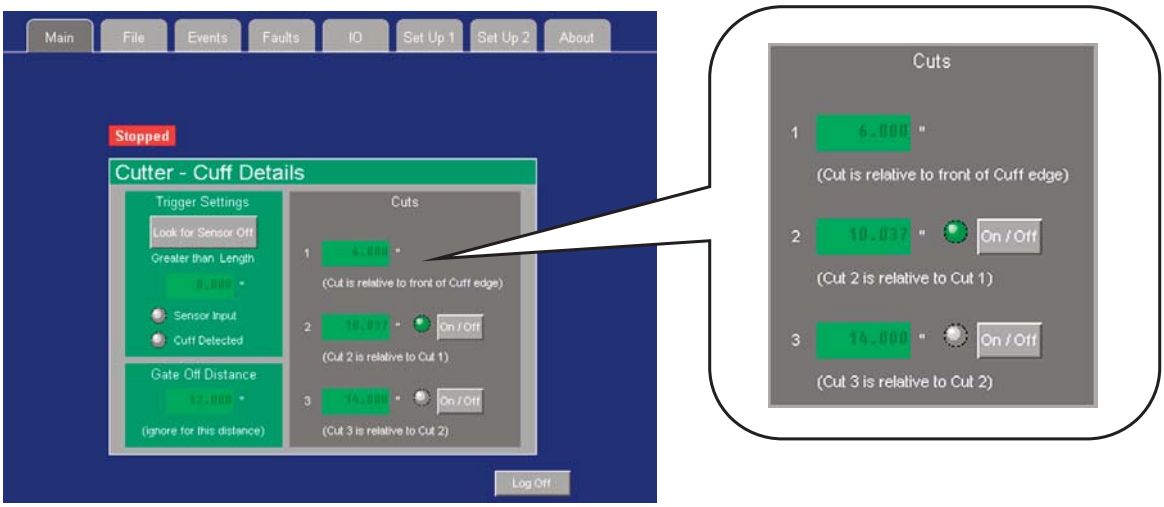
To set the Gate Off Distance:

1 **Press the Gate Off Distance window.** A pop-up keyboard appears.

2 **Press "Enter".** The pop-up keyboard is removed. The new Gate Off Distance will now be displayed.

Cuff Page Description (continued)

Cuts



Up to three cuts may be made from one Cuff. Cut 1 cannot be disabled. Cuts 2 and 3 are optional and are generally used for cutting out scrap sections. An option is also included to count or not count the cut that is made by cuts 2 and 3.

To change and activate cuff cut lengths:

1. **Press the Cuts 1, 2 or 3.** A pop-up keyboard appears, enter the new cut length distance. Each cut length is relative to the beginning of a cuff edge.

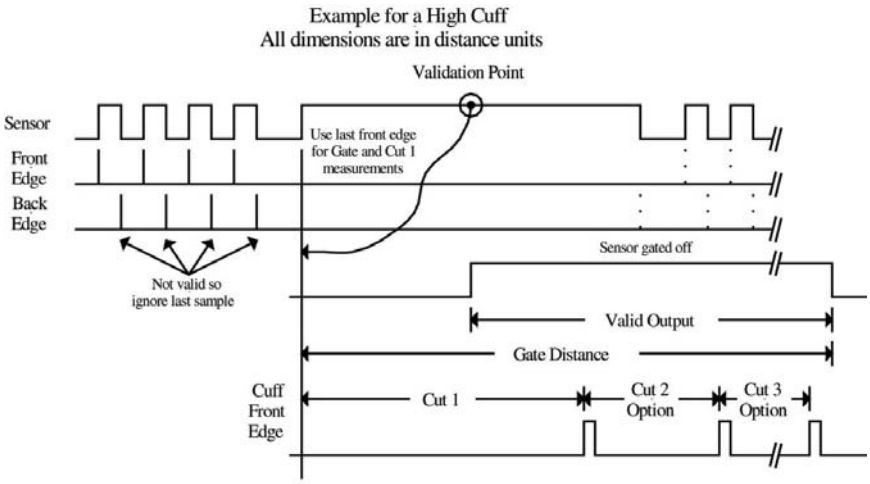
2. **Press "Enter".** The pop-up keyboard is removed. The new cut lengths will now be displayed.

3. **Press the "On/Off" toggle next to Cuts 2 and 3 to activate the cut,** a green light will illuminate to indicate that the cut is activated. Cut 1 can not be disabled.

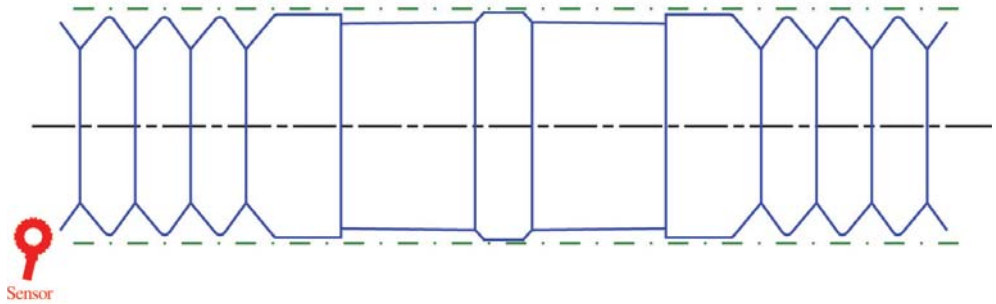
(continued)

Cuff Page Description

Cuts (continued)



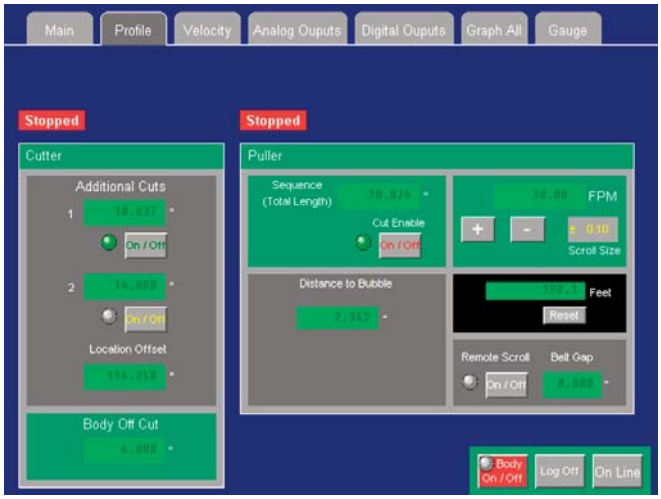
Example Timing Waveforms



Cuff / Corrugation Sample passing through a Cutter bushing

Profile/Bubble/Taper Mode - Profile Page Description

Profile/Bubble/Taper is a special mode that uses a velocity profile to create a product with a varying diameters. *See Operation Section entitled, Modes Page Description*.



A "Profile Settings" button replaces the Length preset that appears on the Main Page when this mode is selected.

To access the Profile/Bubble/Taper Main Sub-Page:

1 Press the Set Up 1 tab and then press the Modes sub tab.

2 Select Profile/Bubble/Taper Mode for both the cutter and puller sections. "Profile" will be displayed at the bottom of each section when properly selected.

3 Press the Main Page tab.

4 A "Profile Settings" button will now be displayed in the cutter portion's Length window.

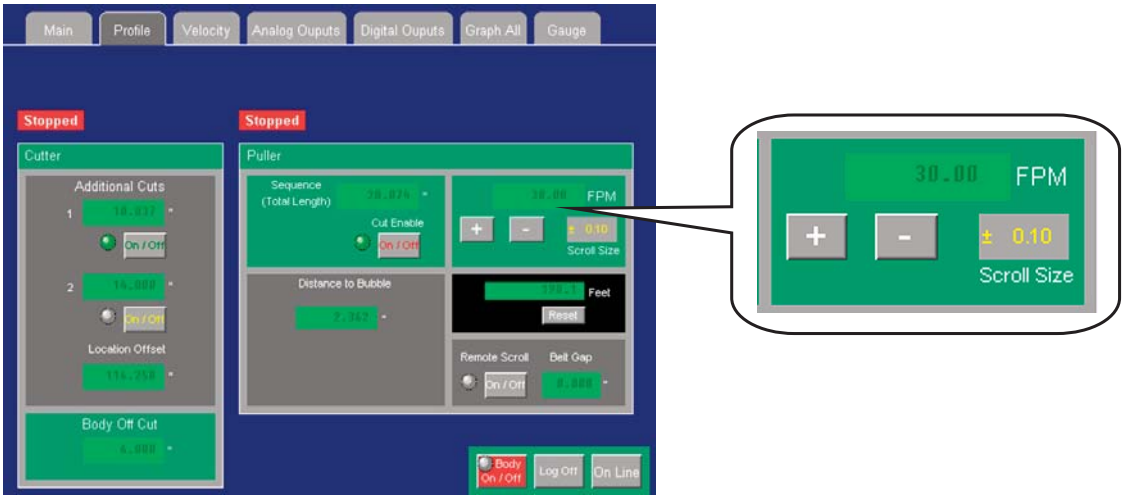
5 Press the "Profile Settings" button to access the Profile/Bubble/Taper Mode Main Sub-Page.

Profile/Bubble/Taper Mode - Profile Page Description (continued)

Puller

The puller section has similar options that are on the Main Page. *See Operation Section entitled, Main Page Description, for Footage Counter, Remote Scroll and Belt Gap descriptions.*

Velocity (FPM)



The velocity (FPM) set here is used to vary the line speed while the "Body On/Off is set to "off".

To change the Body On/Off setting:

1 **Press the "Body On/Off "button found at the bottom-right of the Profile Page,** to toggle the setting on and off. A green indicator light will illuminate when the "Body On/Off" button is set to "On".

If the "Body On/Off" button is set to "Off", the puller runs at a fixed speed using the velocity (FPM) value that is set. This set value may be adjusted using the keyboard or scroll methods. *See Operation Section entitled, Main Page Description, Changing the Puller Speed, Scroll and Keyboard Methods.* Remotes (digital potentiometer, laser gauge) can also be used to change the puller speed.

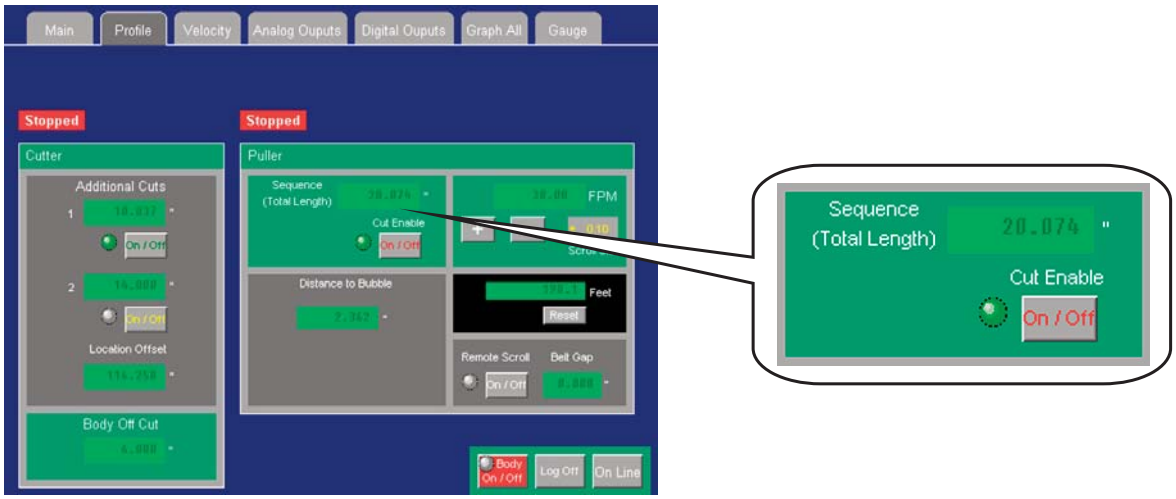
(continued)

Profile/Bubble/Taper Mode - Profile Page Description

Puller

Velocity (FPM) (continued)

If the "Body On/Off" button is set to "On", the velocity section (FPM) becomes locked out. The value shown for speed is the actual speed only, which can not be altered. The scroll buttons will disappear and a (Read only) message appears.



Sequence (Total Length)

This defines the entire length of the Profile/Bubble/Taper product including any portions that are to be scrapped. This length can only be altered by using the keyboard method.

To change the Sequence (Total Length):

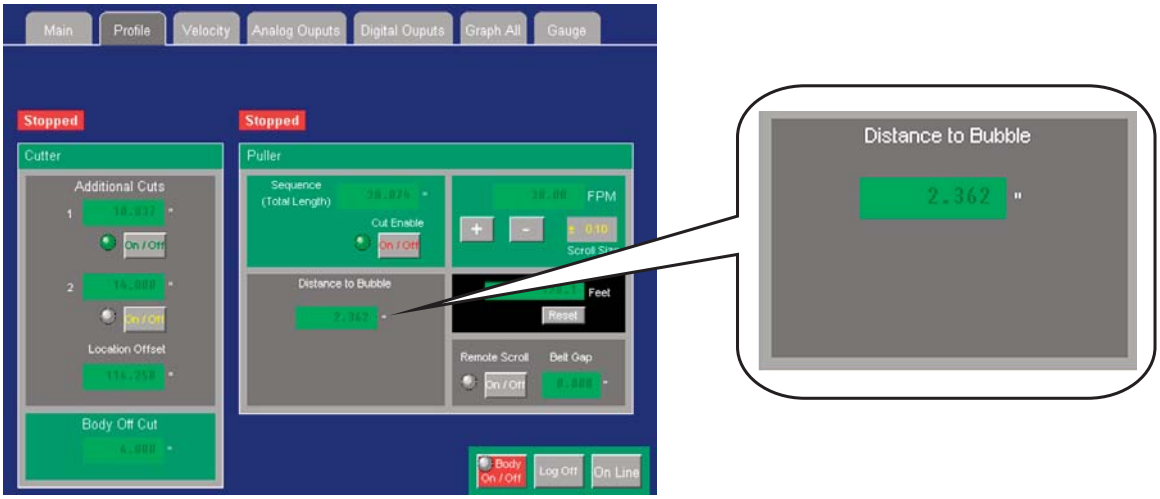
1. **Press the Sequence (Total Length) window.** A pop-up keyboard appears
2. **Key in the new Sequence (Total) Length and press "Enter".** The pop-up keyboard is removed.

The "Cut Enable On/Off" button within the Sequence (Total Length) window is used with Profile/Bubble/Taper products when the "Body On/Off" button is turned "On". When enabled a cut is made at the beginning of the sequence (total length). This cut would normally occur in the center of the tip section (the smallest diameter section of the Profile/Bubble/Taper tubing product).

(continued)

Profile/Bubble/Taper Mode - Profile Page Description

Puller (continued)



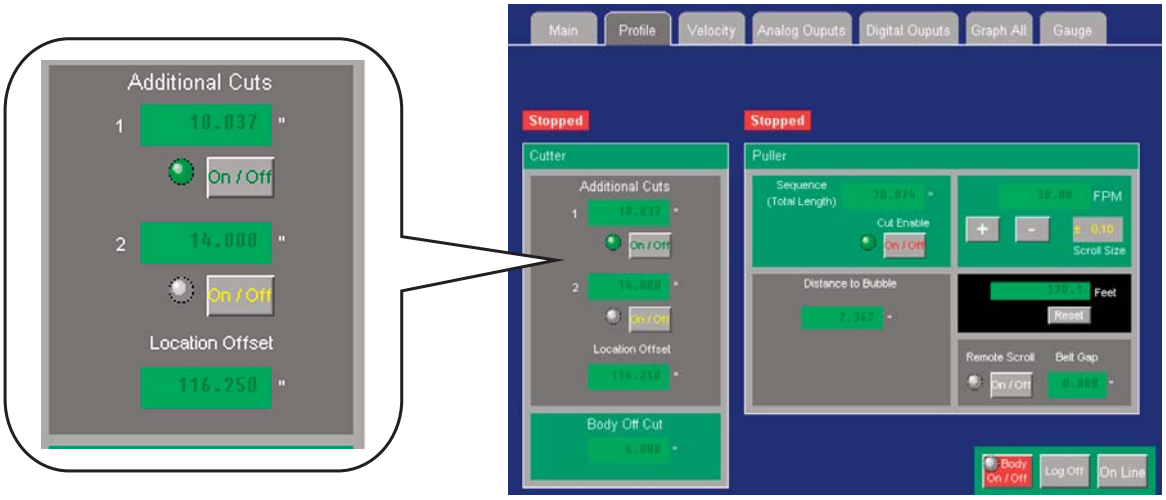
- **Distance to Bubble** - This value is the distance from the Sequence cut to the start of the bubble (largest diameter section of the Profile/Bubble/Taper tubing product). The speed at both ends of this length remains at the tip (maximum) velocity.

To change the Distance to Bubble length:

1. **Press the Distance to Bubble window.** A pop-up keyboard appears
2. **Key in the new Distance to Bubble Length and press "Enter".** The pop-up keyboard is removed.

Profile/Bubble/Taper Mode - Profile Page Description (continued)

Cutter



Location Offset

Location Offset is available to adjust and set the physical distance between extruder die and the cutter blade of the Medline Combination Puller/Cutter. This preset is needed to ensure that all cuts are synchronized with the profiles, bubbles, tapers within the product.

To set the Location Offset:

1 Measure the distance from the extruder die and the cutter blade.

2 Press the Location Offset window. A pop-up keyboard appears.

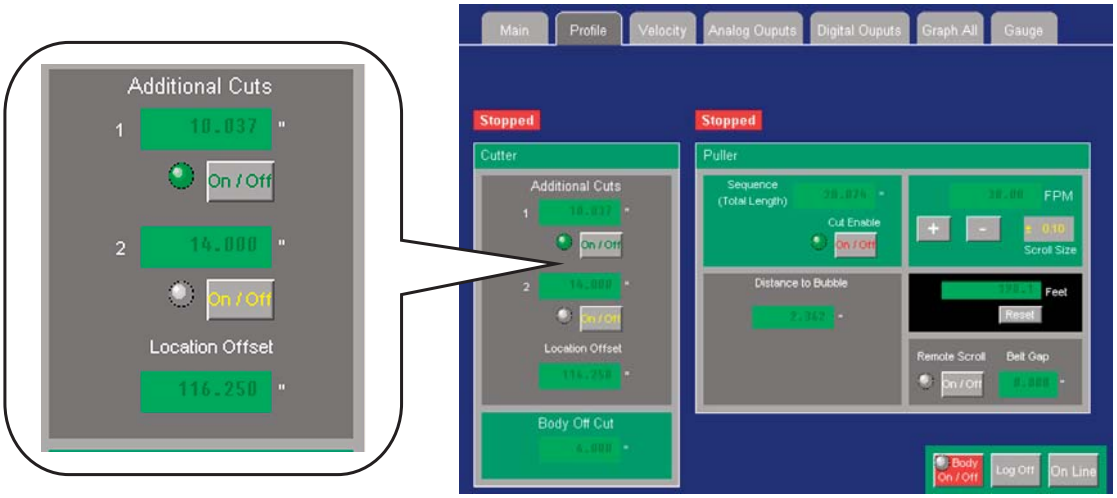
3 Enter the distance from the extruder die and the cutter blade.

4 Press "Enter". The pop-up keyboard is removed.

5 The new distance is now displayed in the Location Offset window.

Profile/Bubble/Taper Mode - Profile Page Description

Cutter (continued)



Additional Cuts 1 and 2

These two entries are used to provide two extra cuts within the Sequence (Total) Length with the capability to turn on or off the cut. Both of these cuts are relative to the start of the sequence. Color-coding is used to ensure that the preset is correctly adjusted for a certain cut length. *See Operation section entitled, Velocity Page Description.*

To set Additional Cut lengths:

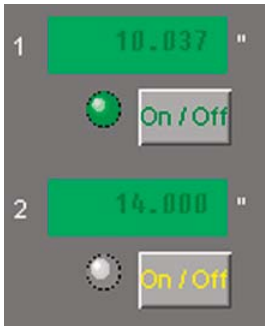
1 Press the Additional Cuts 1 and/or 2 window. A pop-up keyboard appears.

2 Enter the new additional cut length(s). Ensuring that the cut length(s) are within the Sequence (Total) Length.

3 Press "Enter". The pop-up keyboard is removed.

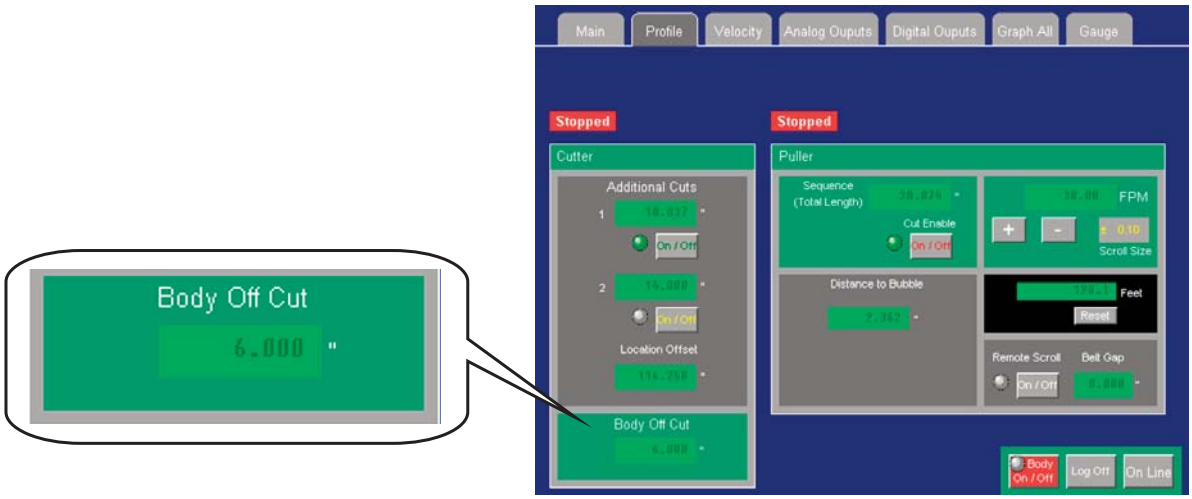
4 The new distance is now displayed in either the Additional Cuts 1 or 2 window.

5 Press the toggle "On/Off" button underneath either cut length to activate the cut length.



Profile/Bubble/Taper Mode - Profile Page Description

Cutter (continued)



Body Off Cut

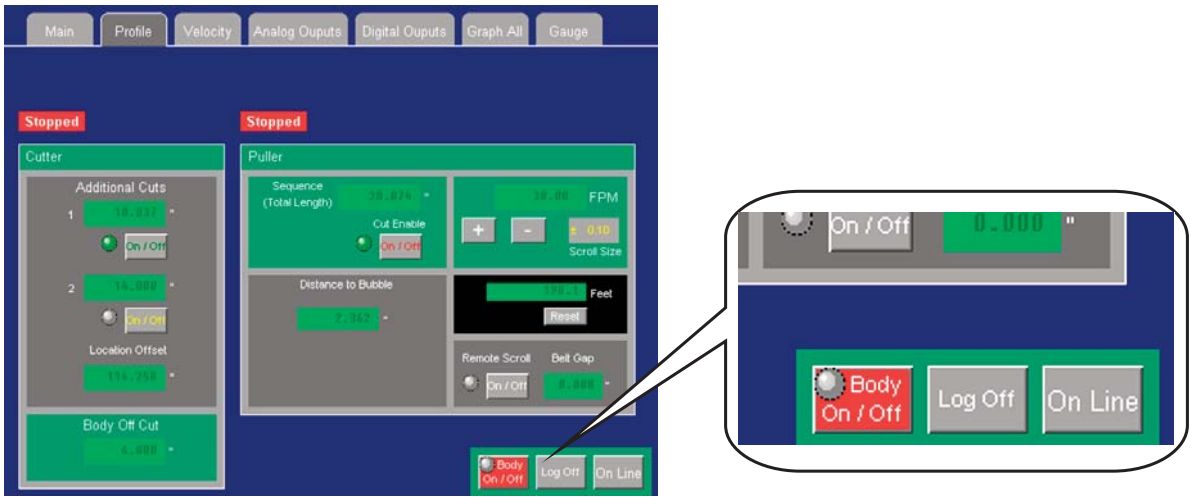
This length is used to cut the product while the "Body On/Off" toggle button is set to "Off". This value will be ignored when the "Body On/Off" button is set to "On". The Body Off Cut length is a user preference.

To activate and change the Body Off Cut length:

1. **Press the Body Off Cut window.** A pop-up keyboard appears.
2. **Enter the distance, in inches, for the cut length.**
3. **Press "Enter".** The pop-up keyboard is removed.
4. **Press the "Body On/Off button to activate or deactivate the cut length.** A green light will illuminate on the "Body On/Off" button when it is activated All changes to this page will not take effect when the setting is On Line. *See Operation Section entitled, Cutter, On Line/Off Line.*

Profile/Bubble/Taper Mode - Profile Page Description

Cutter (continued)



On Line/Off Line

When set to "Off Line" this feature allows changes to be made without affecting the current product.

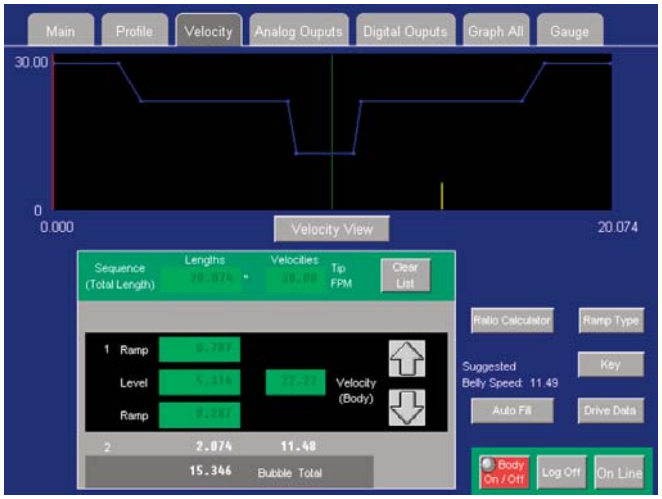
To activate changes made to this page:

1 **View the Graph Page once all changes are made, to ensure proper operation.** *See Graph All Page to view all length and velocity relations.*

2 **Press the "Off Line" button, if currently Off Line, this will then select On Line.** All values will then download and the new changes will be activated.

IMPORTANT: If activating any new lengths or velocities be sure to allow the product to stabilize before activating Total or Batch Counters.

Profile/Bubble/Taper Mode - Velocity Page Description



The velocity page has a scrollable list of presets for setting profile. Up and down buttons are used to scroll through the list. There are three values required for every index section. These are marked Ramp, Level and Velocity.

To access the Profile/Bubble/Taper Velocity Sub-Page:

1 Press the Set Up 1 tab and then press the Modes sub-tab.

2 Select Profile/Bubble/Taper Mode for both the cutter and puller sections. "Profile" will be displayed at the bottom of each section when properly selected.

3 Press the Main tab.

4 A "Profile Settings" button will now be displayed in the cutter portion's length window.

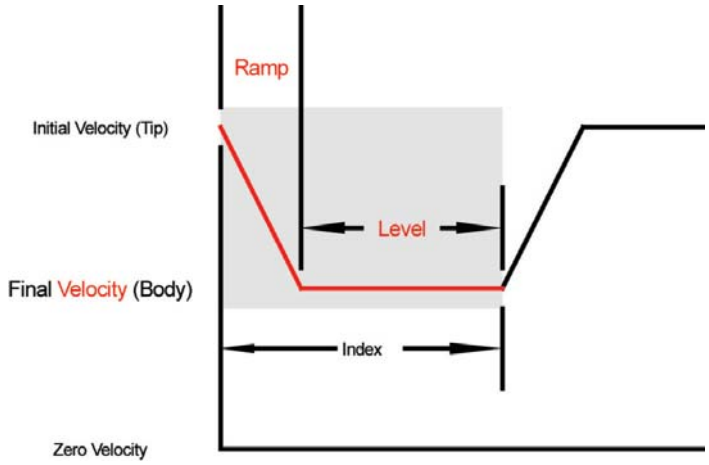
5 Press the "Profile Settings" button to access the Profile/Bubble/Taper Main Page.

6 Press the Velocity tab to access the Profile/Bubble/Taper Velocity Sub-Page.

Profile/Bubble/Taper Mode - Velocity Page Description

Index

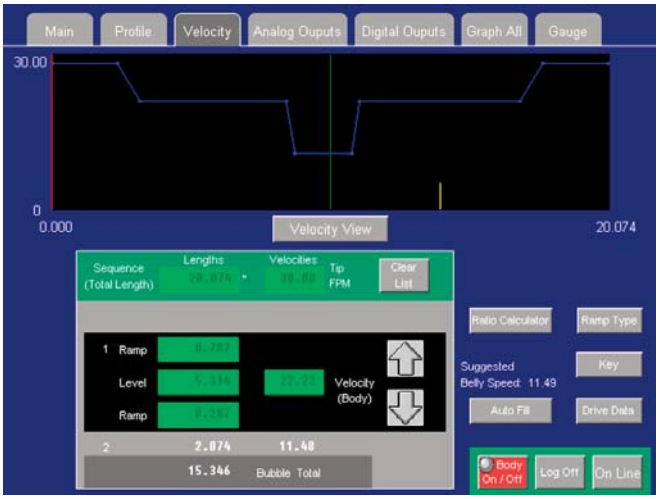
Every index has two ramps (a front edge ramp and a back edge ramp). The back edge ramp is also the front edge ramp for the index that follows, i.e. indexes 1 and 2 share a ramp (the transition between the two velocities). *See the illustration below for a graphical representation of an index.*



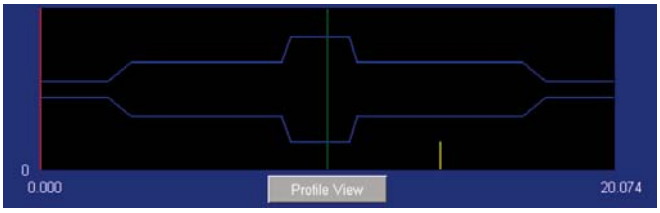
(continued)

Profile/Bubble/Taper Mode - Velocity Page Description

Index (continued)



Velocity View



Profile View

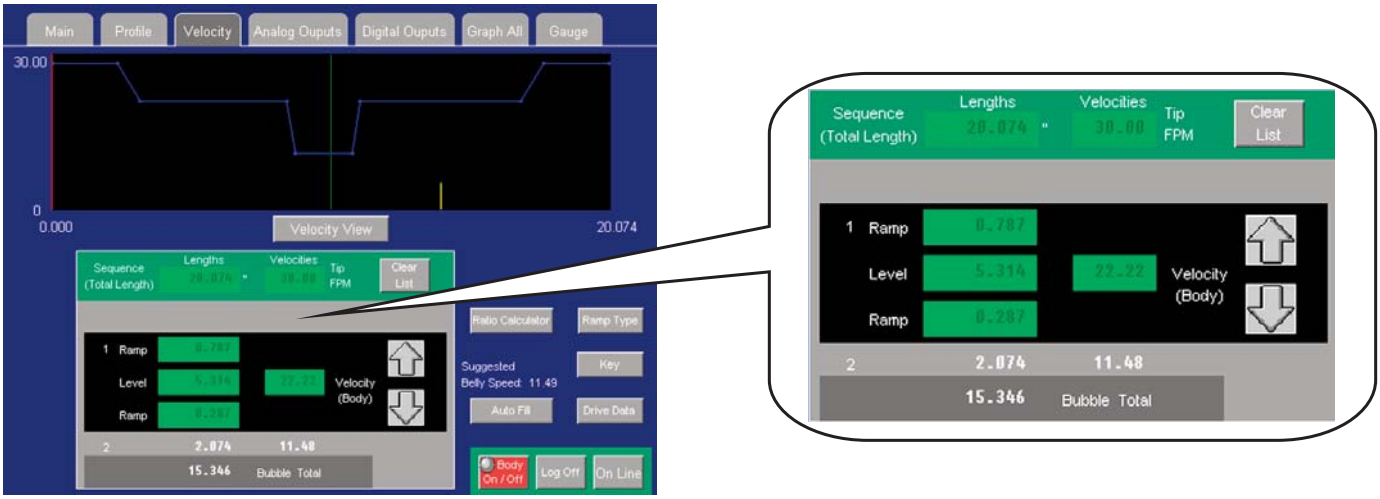
A graph is available on the Velocity Page which shows a velocity waveform that is to scale or a profile simulation. The graph can be toggled from velocity to profile by pressing the “Velocity View/Profile View” button.

The graphs include the cut positions as vertical lines going through the product. These are color-coded to match the colors on the Cut On/Off buttons on the Profile Page, for the Sequence Length and Additional Cuts 1 and 2. When a cut is enabled the line is drawn from the top of the graph to the bottom. When the cut is disabled the line is truncated. In the Profile View example above, two cuts are enabled as shown by the red and green lines. The third cut shown by the truncated yellow line is off.

(continued)

Profile/Bubble/Taper Mode - Velocity Page Description

Index (continued)



- **Sequence (Total Length)** - This is a copy of the same preset that is on the Profile Page.

- **Tip Velocity** - This sets the tip speed for the profile when On Line and the Body On/Off is set to "On". It also sets the maximum speed for the speed points in the table below the Tip Velocity preset.

- **Ramp Length** - This is the length used for the speed transition (velocity change) for a set index.

- **Level Length** - This is the length that will be maintained at the set velocity for this index.

- **Velocity** - This is the target velocity for the index to be achieved at the end of the front edge ramp. Target velocities may be higher or lower than the previous velocity as long as they do not exceed the Tip Velocity. The front edge ramp can be used for increasing (ramp up) or decreasing (ramp down).

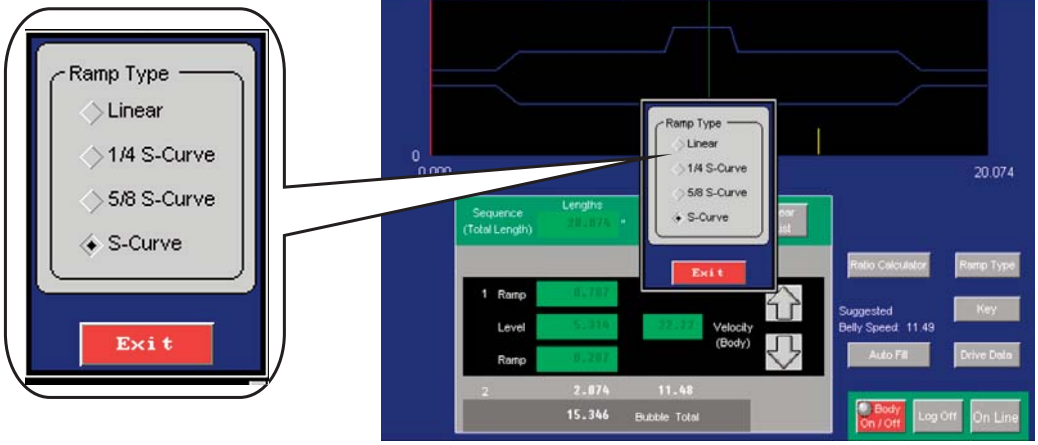
- **Bubble Total** - A running total of the bubble length is shown here.

- **Clear** - This button resets all lengths to zero except Sequence Length. In addition, all velocities are set to the Tip Velocity.

NOTE: All values can be changed by pressing individual windows and using the keyboard method to alter the value. *See Operation Section entitled Setting the Cutter Length Scroll and Keyboard Methods.*

Profile/Bubble/Taper Mode - Velocity Page Description (continued)

Ramp Type



NOTE: Rounding of edges occurs naturally in the product due to elasticity.

Ramp types can be changed while the machine is running to test ramp effect on types of extruded material. Four types of ramps are available, a S-Curve type may be used to provide rounding of the extruded at the ramp ends. This may help to reduce the amount of points needed to create a product. *See Operation Section entitled, Set Up 1 Page Description, Ramps Page for a description of each of the 4 types of ramps.*

To alter the ramp type on extruded material:

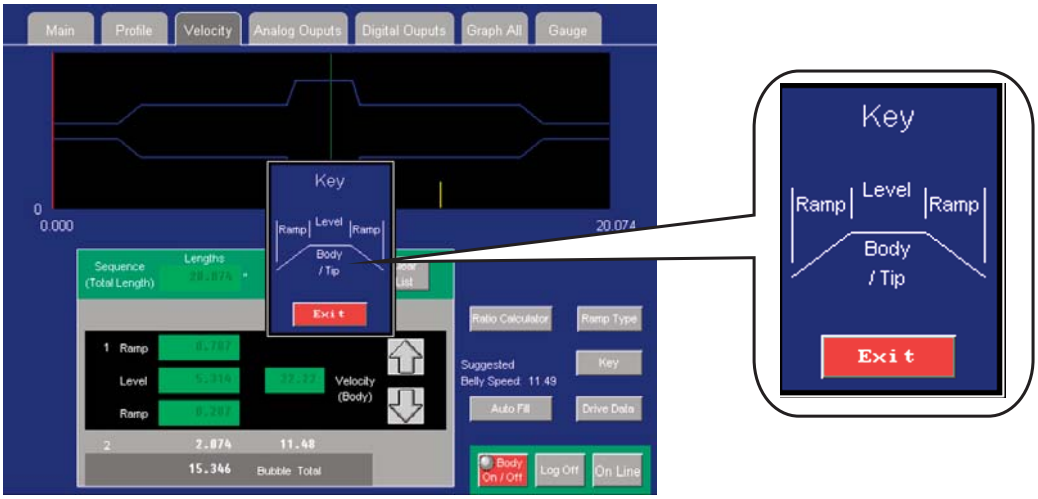
1 Press the "Ramp Type" button.

2 Select the type of ramp from the pop-up Ramp Type window by pressing on the radio button located to the left of the ramp to be used.

3 Press the "Exit" button once the ramp type has been selected.

Profile/Bubble/Taper Mode - Velocity Page Description (continued)

Key



The "Key" button can be used to show a simplified diagram showing the aspects of an index.

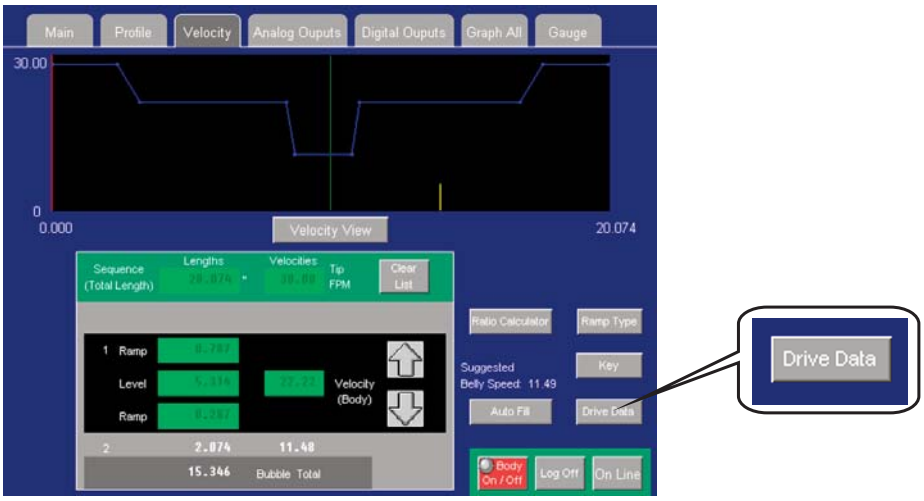
To access the Index pop-up guide:

1 Press the "Key" button.

2 Press the "Exit" button, once finished viewing the Key.

Profile/Bubble/Taper Mode - Velocity Page Description (continued)

Drive Data



The drive receives the information that the operator enters into the Combination Puller/Cutter, but in a different format. A pop-up is shown after pressing the "Check Drive Data" button from the Velocity Page. The button, when pressed, shows a list of values that are downloaded into the drive. This list is primarily for diagnostic purposes, which the operator can ignore.

To access the Drive Data list:

1 Press the "Drive Data" button.

2 Press the "Exit" button to remove the Drive Data list.

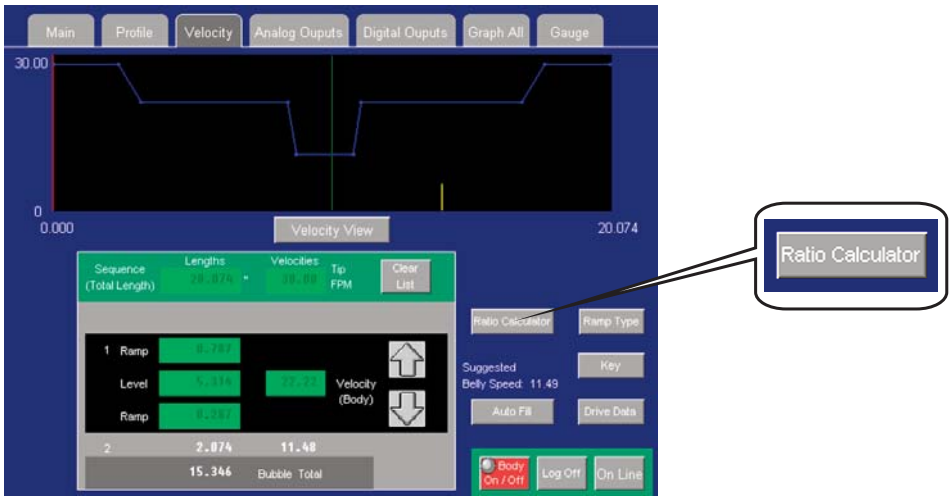
Drive Data is formulated as follows:

Velocity = Final Velocity
Length = Ramp Length + Level Length
Ramp = absolute

$$\left(\frac{(\text{Final Velocity} - \text{Initial Velocity}) \times (\text{Final Velocity} + \text{Initial Velocity})}{2 \times \text{Ramp Length}} \right)$$

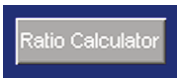
Profile/Bubble/Taper Mode - Velocity Page Description (continued)

Ratio Calculator

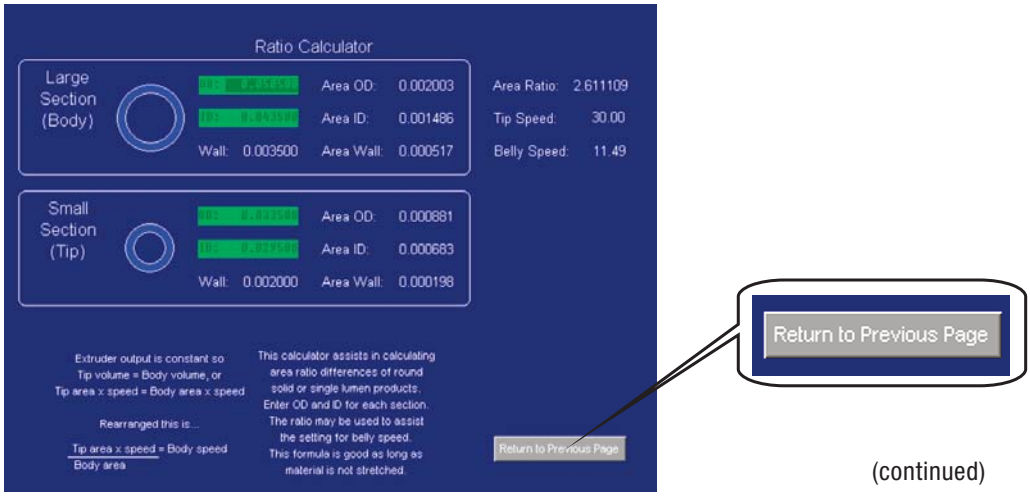


The Velocity Page includes a Ratio Calculator. This is used to help the operator determine what the body speed needs to be in relation to the Tip Speed.

To access the Ratio Calculator:

1 Press the "Ratio Calculator" button. 

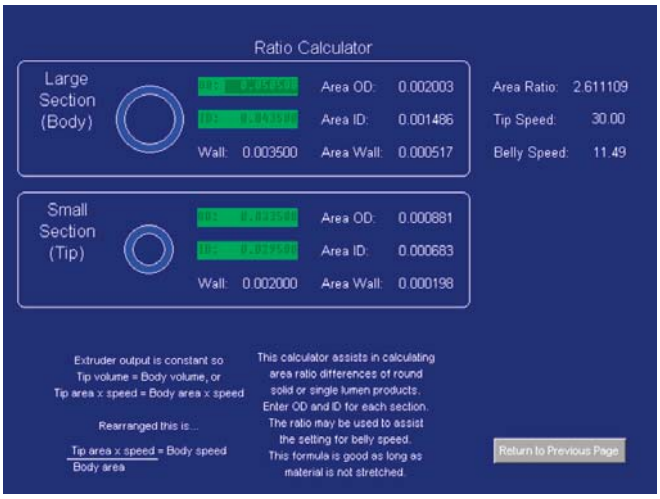
2 Press the "Return To Previous Page" button once all calculations have been made.


Ratio Calculator
Large Section (Body)
Area OD: 0.002003
Area ID: 0.001486
Wall: 0.003500
Area Wall: 0.000517
Area Ratio: 2.611109
Tip Speed: 30.00
Belly Speed: 11.49
Small Section (Tip)
Area OD: 0.000881
Area ID: 0.000683
Wall: 0.002000
Area Wall: 0.000198
Extruder output is constant so
Tip volume = Body volume, or
Tip area x speed = Body area x speed
Rearranged this is...
Tip area x speed = Body speed
Body area
This calculator assists in calculating area ratio differences of round solid or single lumen products.
Enter OD and ID for each section.
The ratio may be used to assist the setting for belly speed.
This formula is good as long as material is not stretched.
Return to Previous Page
Return to Previous Page

(continued)

Profile/Bubble/Taper Mode - Velocity Page Description

Ratio Calculator (continued)


Ratio Calculator
Large Section (Body)
Area OD: 0.002003
Area ID: 0.001486
Wall: 0.003500
Area Wall: 0.000517
Area Ratio: 2.611109
Tip Speed: 30.00
Belly Speed: 11.49
Small Section (Tip)
Area OD: 0.000881
Area ID: 0.000683
Wall: 0.002000
Area Wall: 0.000198
Extruder output is constant so
Tip volume = Body volume, or
Tip area x speed = Body area x speed
Rearranged this is...
Tip area x speed = Body speed
Body area
This calculator assists in calculating area ratio differences of round solid or single lumen products.
Enter OD and ID for each section.
The ratio may be used to assist the setting for belly speed.
This formula is good as long as material is not stretched.
Return to Previous Page

The extruder emits a constant volume of material, so the ratio of speeds to make a product will be the inverse ratio of the wall area. The Ratio Calculator assists in the calculating the area ratio of round solid or single lumen products. Enter the OD (outside diameter) or the ID for each section.

The Area Ratio (found on the right side of the screen) is used with the Tip Speed to determine the Belly Speed. In the example above, the diameters of the product were entered in the OD and ID windows and an area ratio of approximately 2.6:1 was calculated. If the Tip Speed is 30 FPM, then the Belly Speed needs to be 11.49 FPM to create the desired bubble.

The new calculated value does not factor the stretch of the material that occurs when air is used to create the OD and ID. Only use the calculated result as a basis for achieving the speed required to make a product.

To enter the OD and ID of both the Large Section (Body) or the Small Section (Tip) of the material that is being produced:

1 **Press the OD or ID window of either the Large or Small product section.** A pop-up keyboard will appear.

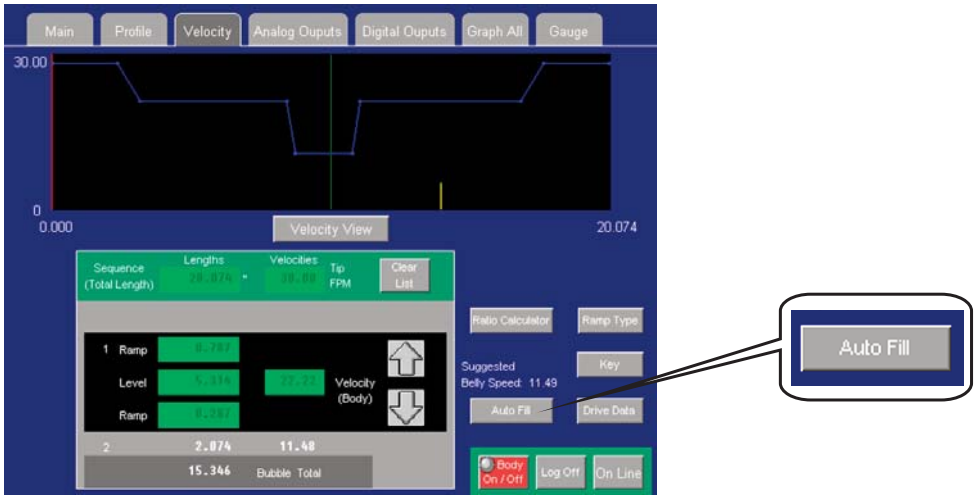
2 **Key in the new OD or ID**.

3 **Press the "Enter" button.** The pop-up keyboard will be removed.

(continued)

Profile/Bubble/Taper Mode - Velocity Page Description

Ratio Calculator (continued)



When using the Ratio Calculator there is a button that can be pressed to allow an operator to insert the new velocity that was calculated on the Ratio Calculator Page. The new velocity will need to be fine-tuned when air is affecting the size of the tubing.

1 **From the Velocity Page, press the "Auto Fill" button.** This will take the Belly Speed that was calculated with the Ratio Calculator and insert it into the Velocity (Body) window found inside the table on the Velocity Page.

If using more than one Index:

1 **Calculate the second Index using the Ratio Calculator.**

2 **Press the "Return To Previous Page" button once all calculations have been made.**

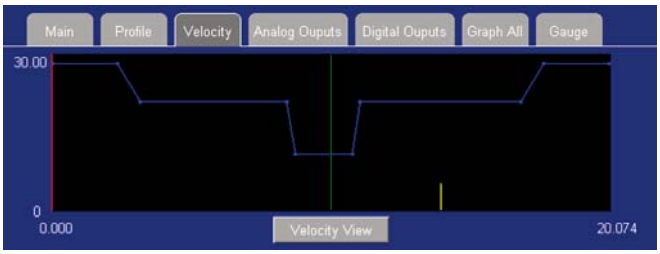
3 **Press the "Down" arrow buttons to scroll to view the second Index window. (Ramp, Index, Ramp)**

4 **Press the "Auto Fill" button.** This will take the Belly Speed from the Ratio Calculator and insert the value into the second Velocity (Body) window found inside the table on the Velocity Page.

Profile/Bubble/Taper Mode - Velocity Page Description (continued)

Zoom

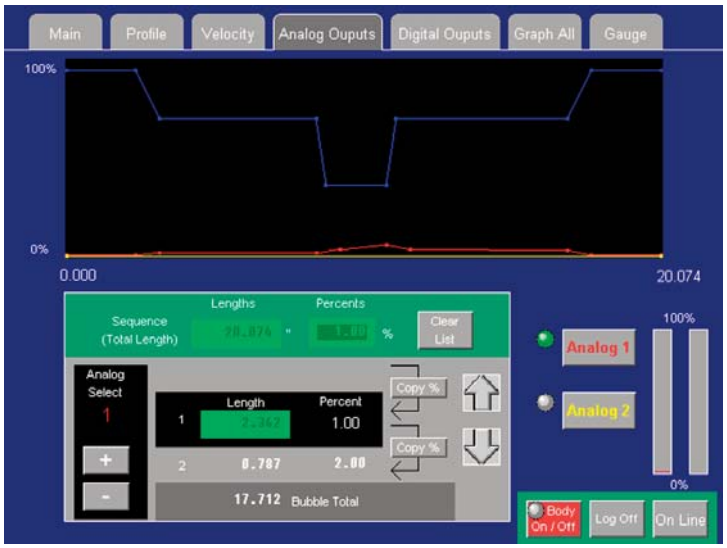
All graphs have a Length Zoom. Press any point on the graph to zoom in, press the graph again to zoom out. If the point pressed is before that start of a bubble, the zoomed image fills from the zero point or start of the sequence on the left to the distance of the pressed position.



If the point pressed is after the start of the bubble, the zoomed image will show the start of the bubble on the left and the position of the pressed position on the right.

The Zoom can also be changed by entering a new value in the length window on the right of the graph. *See Operation Section entitled, Main Page Description, Changing the Puller Speed, Scroll and Keyboard Methods*

Profile/Bubble/Taper Mode - Analog Outputs Page Description



This page is for setting up analog profiles that occur in synchronization with the Velocity Profile. The velocity waveform appears in the graph area as a blue trace to aid the placement and sizing of the analog waveforms.

To access the Profile/Bubble/Taper Analog Output Sub-Page:

1 Press the Set Up 1 tab and then press the Modes sub tab.

2 Select Profile/Bubble/Taper Mode for both the cutter and puller sections. "Profile" will be displayed at the bottom of each section when properly selected.

3 Press the Main tab.

4 A "Profile Settings" button will now be displayed in the cutter portion's length window.

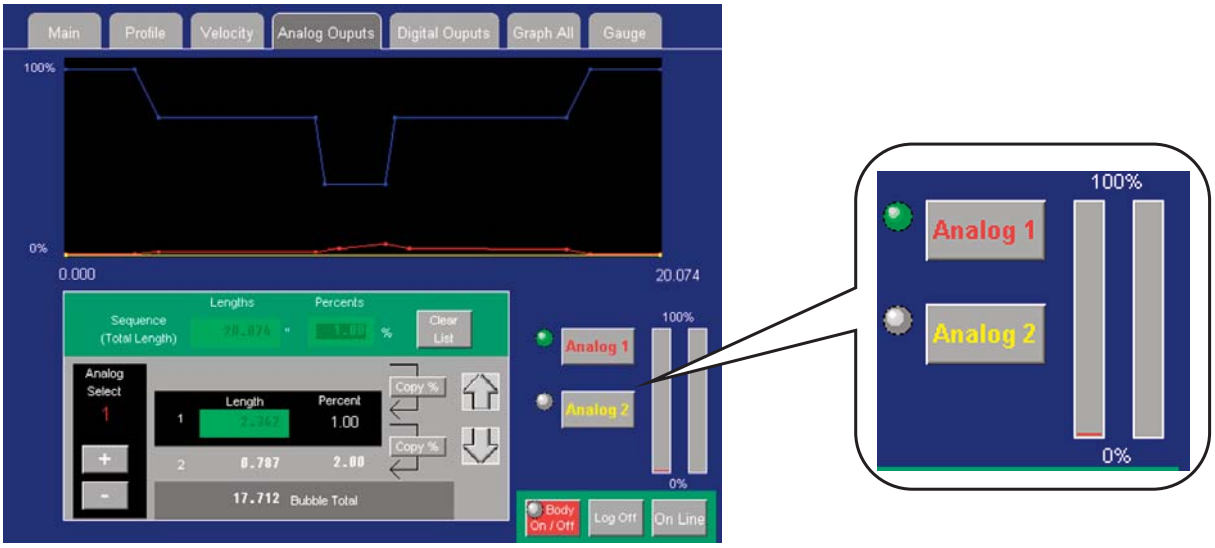
5 Press the "Profile Settings" button to access the Profile/Bubble/Taper Main Page.

6 Press the Analog Outputs tab to access the Profile/Bubble/Taper Analog Outputs Sub-Page.

(continued)

Profile/Bubble/Taper Mode - Analog Outputs Page Description

(continued)



Analog Outputs are an optional feature used with Profile/Bubble/Taper Mode. In some cases bubbles are created using digital air valves that can be switched on and off. When Analog Outputs are provided, a PLC (Programmable Logic Controller) will be included for every two channels of analog. Options are none or 2, 4, 6 or 8 channels of analog.

The following description will be based using only two channels of analog.

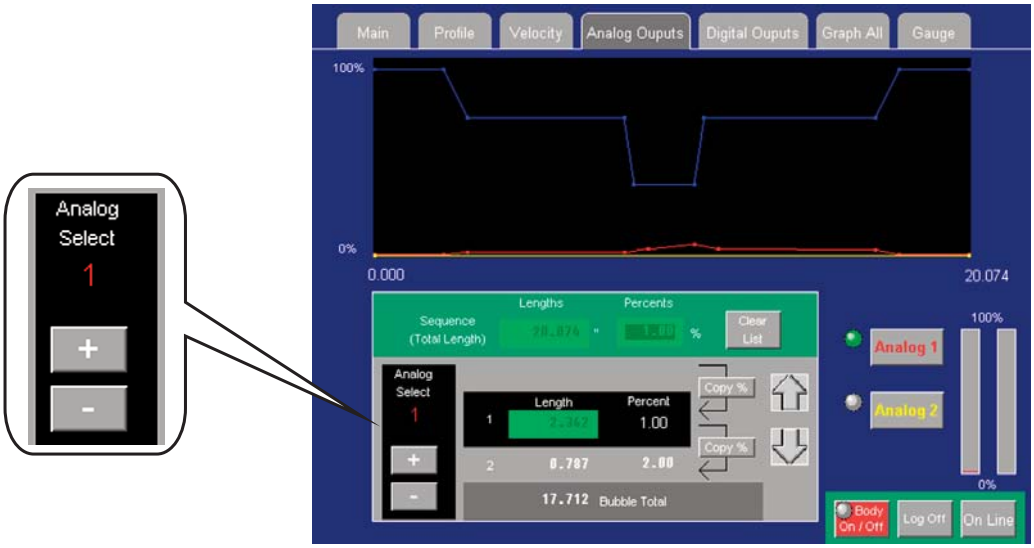
Analog 1 is drawn using a red trace and Analog 2 has a yellow trace. A list of 32 lengths and percents are provided for each channel. Each length and percent pairing is used to define a point on the graph in a typical x, y fashion. Lengths define the distance from the previous point. Percents relate to the level of output for each point. In this example, the amount of air pressure and duration of “on time” of the air valve. Zero to 100% is used to describe the amount of air used.

In most cases this will correspond to a 0-10 volt DC output (0 to 5 volt DC or 4 to 20 mA are other output choices).

(continued)

Profile/Bubble/Taper Mode - Analog Outputs Page Description

(continued)



Each Analog Output is selectable by using the (+) or (-) buttons found on the left-side of the Analog Output Page or by using the keyboard method. Each analog channel is color-coded to match the line color used on the graph portion of the Analog Outputs Page.

To select a analog channel (keyboard method):

1 **Press the Analog Select number.** A pop-up keyboard appears.

2 **Enter the number of the analog channel to be viewed.**

3 **Press "Enter". The pop-up keyboard is removed and the analog channel selected will be displayed along with its output presets (up to 32).**

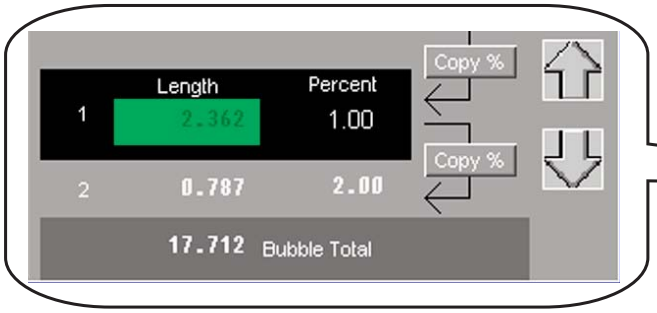
To enable an analog channel:

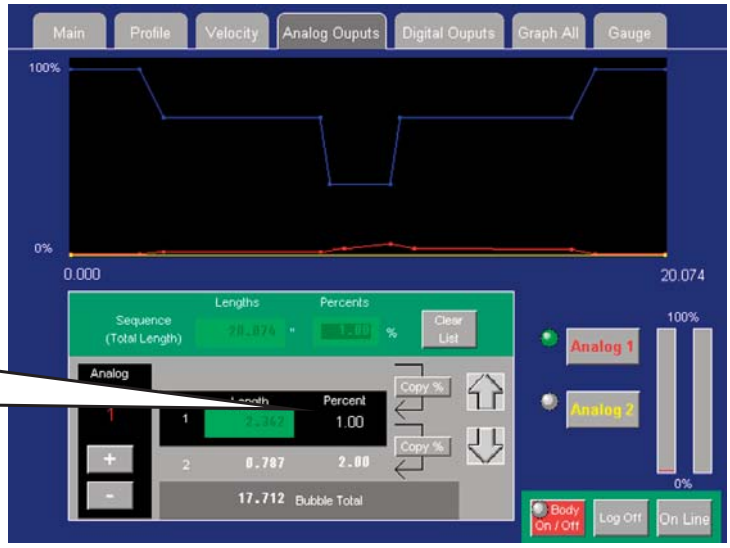
1 **Press the "Analog" button of the output that is required,** a green light will illuminate when the output is activated. Each "Analog" button is labeled with a color-coded system to represent the output on the graph portion of the Analog Output Page.

(continued)

Profile/Bubble/Taper Mode - Analog Outputs Page Description

(continued)





Each Analog Output has 32 setpoint pairs (x,y values). In this example using four x,y pairs, 2.362" and 1.0% are used for the setpoint of position 1. This means that the air will be at 1% after 2.362". If the air is making a transition from one level to another over a length, the points in between the two setpoints are calculated. Using the previous example, position 1 is at 1% and position 2 is at 2%. The change of air will occur over 0.787", at the midway point (0.3935") the output of the air will be at 1.5%.

To adjust the length and air pressure used for each setpoint:

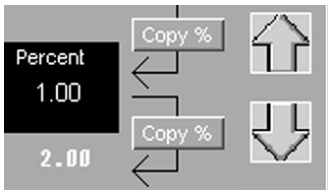
1 **Press the Length window.** A pop-up keyboard appears.

2 **Enter new length to the next position.** Each length is relative to the previous length.

3 **Press "Enter".** The pop-up keyboard is removed.

4 **Press the Percentage window.** A pop-up keyboard appears.

5 **Enter new amount of air pressure to be used (0-100%), and press "Enter".**



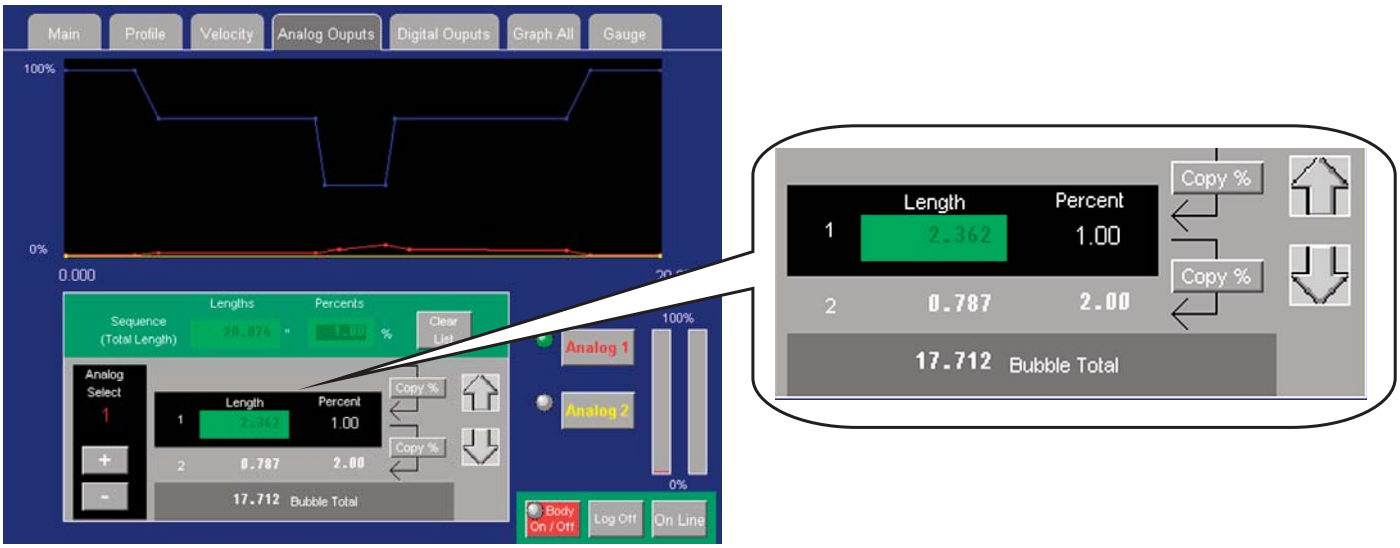
Use the "Up" and "Down" arrow buttons to move up and down the preset list. Typically when using outputs to control air pressure, four setpoints should be used to control the amount the profile tubing will expand and contract.

Each setpoint will be display on the graph at the top of the Analog Output Page. Presets for Analog 1 will be displayed with a red line and presets for Analog 2 will be displayed with a yellow line.

(continued)

Profile/Bubble/Taper Mode - Analog Outputs Page Description

(continued)

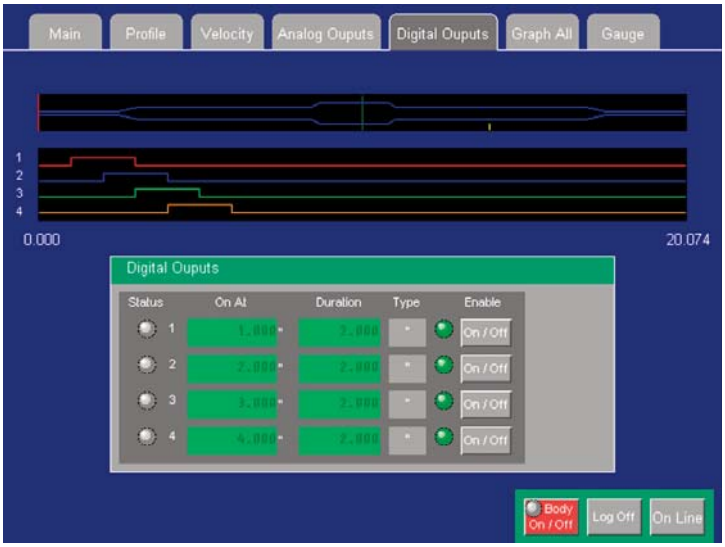


- **Clear List** - Copies the Percent Value on the top line to all the percents in the output list. In addition it sets all lengths in the list to zero. Sequence length is not affected.

- **Bar Graphs -** These reflect the state of the analog outputs. The bar will rise and fall while the puller is running.

- **Copy % to Next** - Two buttons have this feature. They may be used to copy the percent value in the box above to the next box below.

Profile/Bubble/Taper Mode - Digital Outputs Page Description



Digital Outputs are available in groups of four; 4, 8, 12 and 16 digital outputs are possible. A PLC (Programmable Logic Controller) or PLC's provide the digital outputs.

Four digital outputs are shown in this example. A digital output can be on or off. These are typically used to operate pneumatic valves. The digital graph is shown under the profile graph. The waveform shows what will happen while the puller runs.

To access the Profile/Bubble/Taper Digital Output Sub-Page:

1 **Press the Set Up 1 tab and then press the Modes sub tab.**

2 **Select Profile/Bubble/Taper Mode for both the cutter and puller sections.** "Profile" will be displayed at the bottom of each section when properly selected.

3 **Press the Main tab.**

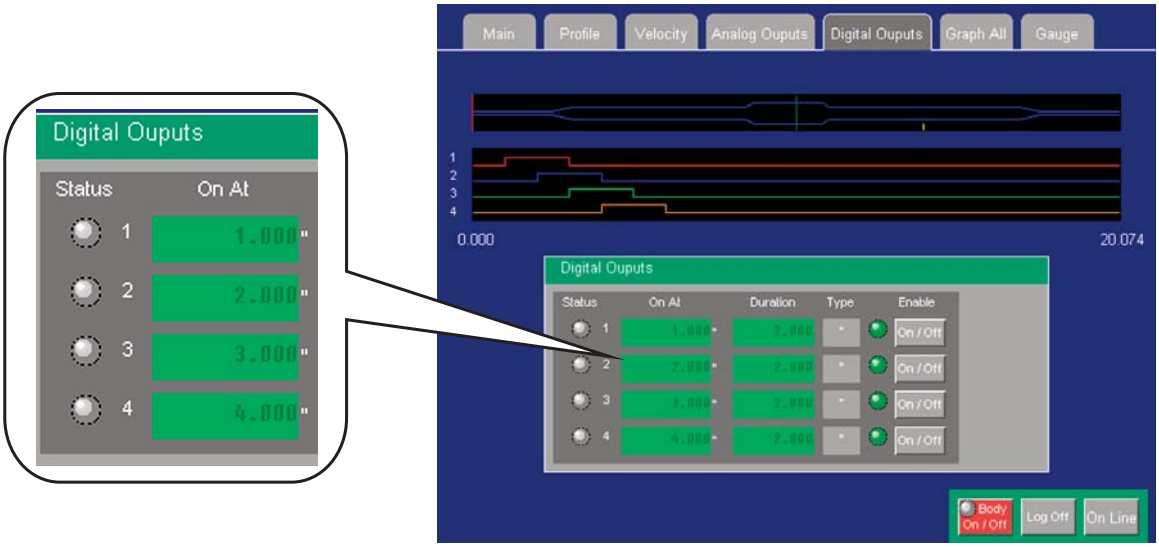
4 **A "Profile Settings" button will now be displayed in the cutter portion's length window.**

5 **Press the "Profile Settings" button to access the Profile/Bubble/Taper Main Page.**

6 **Press the Digital Outputs tab to access the Profile/Bubble/Taper Digital Outputs Sub-Page.**

Profile/Bubble/Taper Mode - Digital Outputs Page Description

(continued)



Setting Output Length and Duration

On At
Each Digital Output has an "On At" point. This is the distance from the beginning of the sequence to when the output turns on. In the sample Output 1 will turn on 1.0" from the start of the sequence. In this example, the length is the distance air pressure will turn on and the duration is length the air will remain on. Each output "On At" length is relative to the beginning of the sequence.

To adjust the length for each setpoint:

1. **Press the On At Length window.** A pop-up keyboard appears.

2. **Enter the new length that the air pressure will turn on.** This distance is from the beginning of the sequence length.

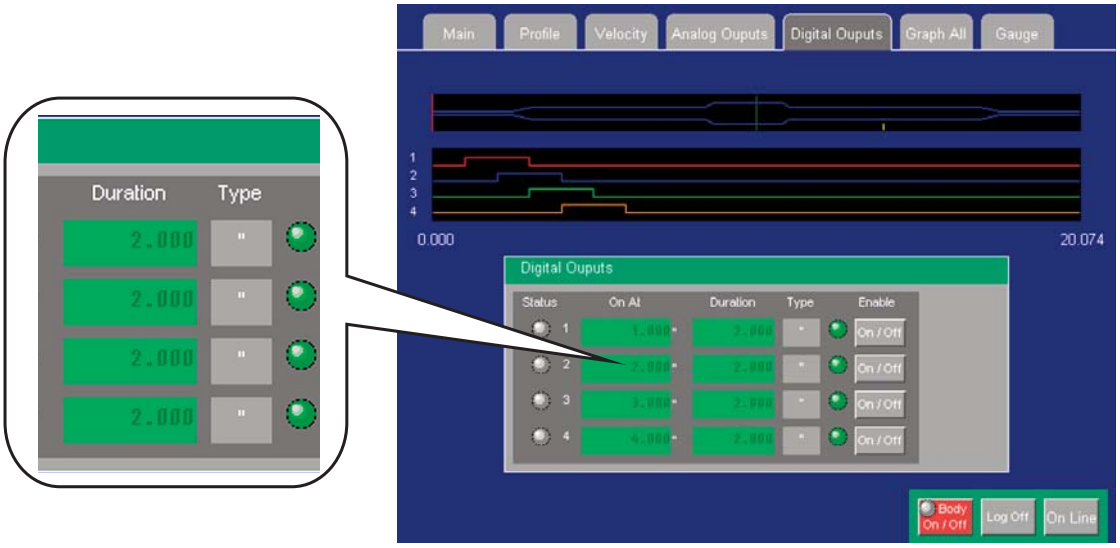
3. **Press "Enter"**. The pop-up keyboard is removed.

4. **Repeat this step for the remainder of digital outputs to be used.** If more than four outputs are used, additional buttons will appear to display what outputs are available. The buttons will contain text showing additional outputs in groups of four, "1-4", "5-8", "9-12" and "13-16". Pressing any of these buttons will display the corresponding outputs.

(continued)

Profile/Bubble/Taper Mode - Digital Outputs Page Description

Setting Output Length and Duration (continued)



Duration
Each Digital Output has a duration. Duration is how long the output remains on. Distance or time can be used. In the sample output 1 has a duration of 2.0" which means the air will turn on at 1.0” and stay on for 2.0”. It will then turn off at 3.0” from the start of the sequence.

The graphical image shows duration as a positional off (distance only). A conversion from time to distance could be calculated but it would need to factor in all velocity changes. For this reason duration will not be represented graphically when time is chosen.

To adjust the duration for each setpoint:

1. **Press the Duration window.** A pop-up keyboard appears.

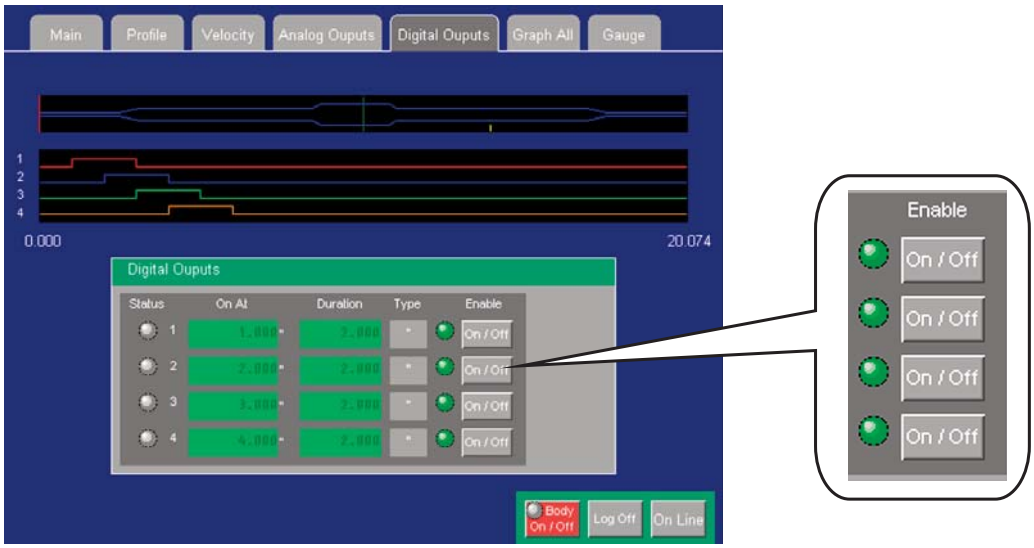
2. **Enter new length that the air pressure will remain on.**

3. **Repeat this step for the remainder of digital outputs to be used.** If more than four outputs are used, additional buttons will appear to display what outputs are available. The buttons will contain text showing additional outputs in groups of four, “1-4”, “5-8”, “9-12” and “13-16”. Pressing any of these buttons will display the corresponding outputs.

(continued)

Profile/Bubble/Taper Mode - Digital Outputs Page Description

Setting Output Length and Duration (continued)

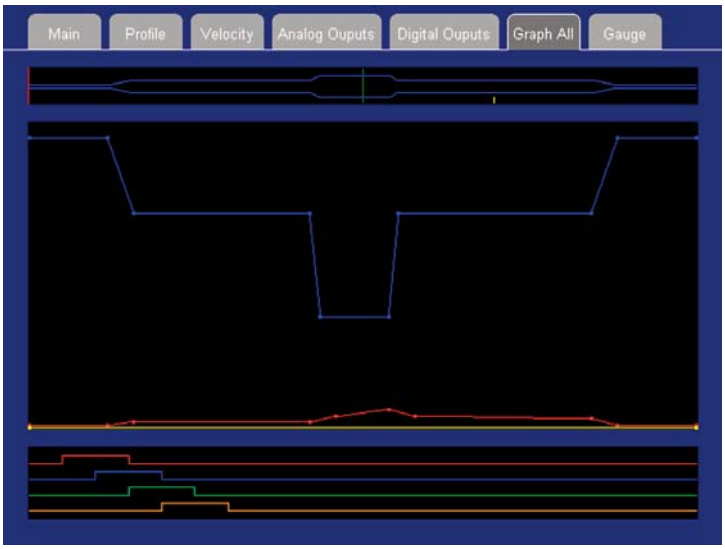


To adjust the type duration for each setpoint:

1 Press the Type window. The display will toggle between length (“) or time (sec).

- **Enable On/Off** - The “Enable On/Off” toggle button is used to enable or disable a particular Digital Output. When it is disabled the output is forced to “Off”. If the puller is stopped all outputs are disabled. A green light will illuminate next to each Digital Output when the output is active.

Profile/Bubble/Taper Mode - Graph All Page Description



All graphs appear together on this page to help show the relationship (positions) for Profile, Cuts, Velocity, Analog and Digital outputs. Numeric data is not shown.

Zoom is available when working with the graph. See Operation Section, entitle Velocity Page Description.

To access the Profile/Bubble/Taper Graph All Sub-Page:

1. **Press the Set Up 1 tab and then press the Modes sub tab.**

2. **Select Profile/Bubble/Taper Mode for both the cutter and puller sections.** "Profile" will be displayed at the bottom of each section when properly selected.

3. **Press the Main tab.**

4. **A "Profile Settings" button will now be displayed in the cutter portion's length window.**

5. **Press the "Profile Settings" button to access the Profile/Bubble/Taper Main Page.**

6. **Press the Graph All tab to access the Profile/Bubble/Taper Graph All Sub-Page.**

Profile/Bubble/Taper Mode - Gauge Control Page Description

The Gauge Page is not not functional in the current program. However, in future programs this page will be used to set scroll (increment) values for each section of the product. There will be adjustment windows for tip and body sections for the puller velocity and each of the Analog Outputs. Separate Raise and Lower inputs will be provided for the gauge to control each section individually.

To access the Profile/Bubble/Taper Gauge Control Sub-Page:

1 Press the Set Up 1 tab and then press the Modes sub tab.

2 Select Profile/Bubble/Taper Mode for both the cutter and puller sections.
"Profile" will be displayed at the bottom of each section when properly selected.

3 Press the Main tab.

4 A "Profile Settings" button will now be displayed in the cutter portion's length window.

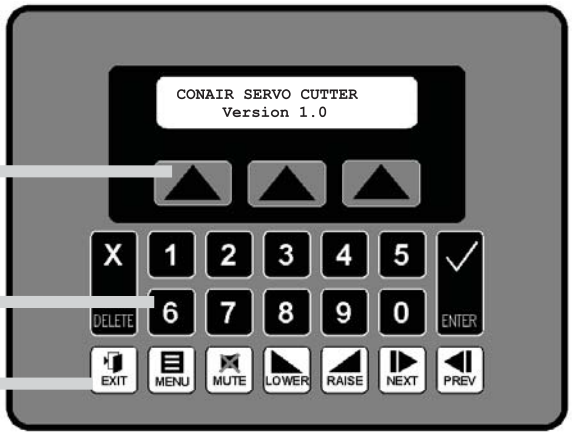
5 Press the "Profile Settings" button to access the Profile/Bubble/Taper Main Page.

6 Press the Gauge Control tab to access the Profile/Bubble/Taper Gauge Control Sub-Page.

Cutter Operator Control Features

The Operator Control provides an intuitive user-friendly method to interface with the Conair Servo Cutter. Information is viewed and entered at the Operator Control and is communicated to the servo positional amplifier via the RS-232 serial communication link.

The Operator Control is a flat membrane panel consisting of 22-keys and a large 2 line x 20 back lit LCD screen.



Soft Keys-allows the operator to select different functions.

Numeric Keys-Permits data entry for the operator

Fixed Function Keys-Contain universal symbols & text

Soft Keys

Soft keys - these are the three keys directly under the display. All three have a triangle on them. Occasionally, pages will appear that allow the operator to use one of the soft keys. On those occasions, text would typically appear directly above the key and the key will have a function. Think of the text as the soft key function indicator or title. These keys will be referred to in this manual from left to right as soft keys 1, 2 and 3 respectively.

Numeric Keys

These are the black keys containing numbers 0 to 9. Numbers permit data entry of parameters. See Raise and Lower for value trim.

Fixed Function Keys (at Bottom)

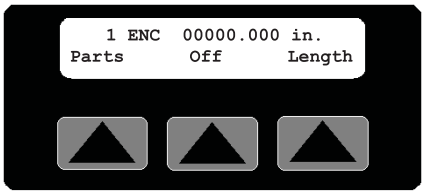
Underneath the numeric keys are fixed function keys. They contain universal symbols and text. The fixed function keys are Raise, Lower, Next, Prev (previous), Enter, Delete, Exit, Menu and Mute. These functions are described in the "Function keys - Fixed Functions" section of this manual.

LCD Screen

The screen shows various pages depending on operator actions. In addition, it is used to indicate warnings. Mostly, it is used for viewing status and for setting parameters.

Cutter Operator Control Instructions Main Screen

MAIN SCREEN
There are two types of main screens, length or time measurement and cuts per minute measurement. The type displayed varies depending on the current cut mode setting. See the mode operator display overviews.



The Main Screen has seven features. The top line displays the active preset (only with multi preset option), cut mode, active measurement and the unit of measure. The bottom line contains three soft key functions, softkey1/Parts, softkey2/cut On/Off and softkey3, which varies depending on the current cut mode setting.

Active Preset
With the multi-preset option in on-demand modes the active preset value changes upon batch completion. As the cutter sequences through multiple presets, the operator always knows which preset is being processed.

Active Measurement
The measurement value displayed will be the active length or time preset or cuts per minute depending on the active cut mode. It displays the value only when the machine is started and softkey2 On/Off is on. If the machine is stopped or softkey2 On/Off is off, this counter will be forced to zero.
If a negative symbol is shown to the left of the measurement value, the encoder signal is reversed, i.e. rotating in the wrong direction. The cutter will not function while the encoder is going negative. It is possible to correct this by using the encoder direction function located in the encoder area of the maintenance area. See the maintenance area display overview.

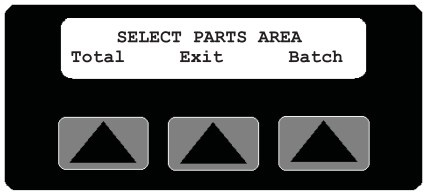
Length, Time or Blade Softkey
This key is mode dependent see the mode operator display overview for the current cut mode.

On/Off Softkey
Under the active measurement in the center of the bottom line of the display is a soft key labeled On or Off. Pressing this key while On is displayed will disable the cutter. Likewise pressing this key while Off is displayed enables the cutter. Pressing the stop button forces the cut enable off.
Manual cuts can still be made while the cut enable is off.

Cutter Control Instructions

Menu function key is used to access the Menu Area
This area can only be accessed from the main display screen for each mode. See the Menu Area section for more information.

Parts Select Area Screen
Under the current mode on the left side of the bottom line of the display is a soft key labeled Parts. Pressing this key accesses the Parts Select Screen.

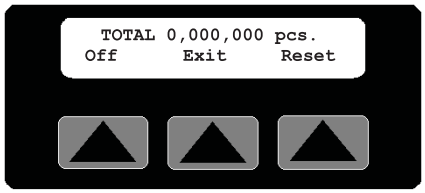


This screen provides access to the parts Total/softkey1 or Batch/softkey3 areas. Pressing Exit/softkey2 returns the display to the active main screen. If no selection is made within 30 seconds the display returns to the active main screen.

EXIT or PREV, fixed function keys return the display to the previous screen.

Cutter Control Instructions: Total Screen

TOTAL SCREEN
By pressing softkey1 located under the word Total on the Parts Select Screen, a seven-decade total counter is available. *Additional information on how to access this screen can be found in the operator display overview in Appendix G of this manual.*



This is typically used to count cut pieces during the day or days that the product is being produced. Sample or manual cuts are not counted. When enabled the count continues to accumulate even if the total display is not being viewed. It is also possible to turn this counter off or on.

On/Off Softkey1
Under the counter on the left is a soft key labeled On or Off. Pressing this key while On is displayed will disable the counter. Likewise pressing this key while Off is displayed enables the counter.

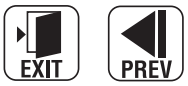
(continued)

Control Instructions: Total Screen (continued)

Exit Softkey2
Under the counter, in the center is a soft key labeled Exit. Pressing this key will return the display to the Parts Select screen.

Reset Softkey3
Under the counter, on the right is a soft key labeled Reset. Pressing this key will zero the counter.

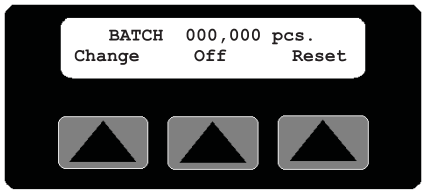
EXIT or PREV, fixed function keys return the display to the Parts Select screen.



Cutter Control Instructions: Batch Screen

BATCH SCREEN

By pressing softkey3 located under the word Batch on the Parts Select Screen, a six-decade Batch counter is available. *Additional information on how to access this screen can be found in the operator display overview in Appendix G of this manual.*



This is typically used to count the pieces required to fill a carton, with the product being cut. The batch counter counts up to the batch preset and resets to zero. As the accumulated count reaches the alarm preset the batch pre-warn output-3 energizes then when the batch preset is reached the batch complete output-2 briefly energizes and both outputs turn back off. Sample/Manual cuts are not counted. When enabled the count continues to accumulate even if the batch display is not being viewed. It is also possible to turn this counter off or on.

Change Softkey1

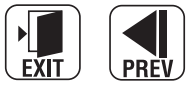
Under the counter, on the left is a soft key labeled Change. Pressing this key displays the Select Batch Area screen. The operator can then choose to set the batch or alarm preset.

On/Off Softkey2

Under the counter near the center is a soft key labeled On or Off. Pressing this key while On is displayed will disable the counter. Likewise pressing this key while Off is displayed enables the counter.

Reset Softkey3

Under the counter, on the right is a soft key labeled Reset. Pressing this key will zero the batch counter.



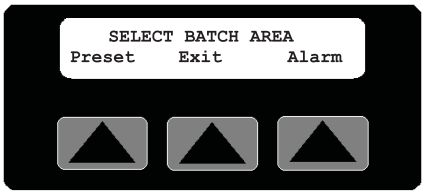
EXIT or PREV, fixed function keys return the display to the Parts Select screen.

(continued)

Cutter Control Instructions: Batch Screen (continued)

Batch Select Area Screen

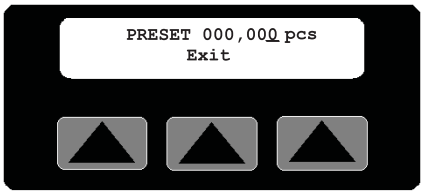
Under the batch counter, on the left is a soft key labeled Change. Pressing this key displays the Select Batch Area screen. *Additional information on how to access this screen can be found in the operator display overview in Appendix G of this manual.*



This screen provides access to the batch Preset/softkey1 or batch Alarm/softkey3 areas. Pressing Exit/softkey2 returns the display to the batch counter screen. If no selection is made within 30 seconds the display returns to batch counter screen.

Batch Preset Screen

By pressing the soft key located under the word Batch on the Batch Area Screen, the preset for the Batch counter is available.



The number shown is the current batch preset. A cursor will appear in the least significant digit. The user has a choice of ways to adjust this number.

Exit or Prev, If no change is required press Exit or Prev to return to the Main screen.

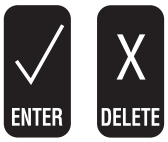
Raise will increase the preset by 1. The key can be pressed once for each increment required or held down to scroll up. Releasing the key will freeze the preset at the last value.

Lower will decrease the preset by 1. The key can be pressed once for each decrement required or held down to scroll down. Releasing the key will freeze the preset at the last value.

(continued)

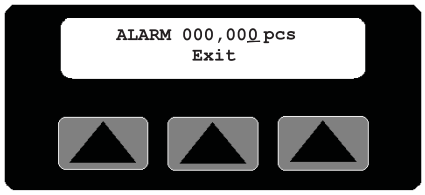
Cutter Control Instructions: Batch Screen (continued)

Numeric keys
Key in the batch required and press enter. If you require a batch of 50 parts you must key in 50 and then press enter.

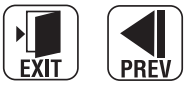


Enter or Delete?
If the keyed in number is correct press the enter key for it to be accepted and return to the Main screen. If it is wrong press the delete key and the previous preset will reappear.

Batch Pre-Alarm Preset Screen
By pressing the soft key located under the word Alarm on the Batch Area Screen, the preset for the Batch pre-warn Alarm is available.



The number shown is the current alarm preset. A cursor will appear in the least significant digit. The user has a choice of ways to adjust this number. See entering the batch preset above. Please note: This value must be less than the batch preset.

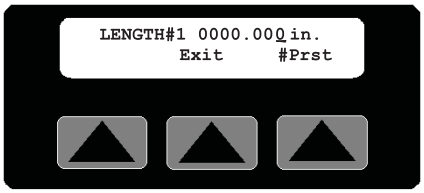


Exit or Prev, if no change is required press Exit or Prev to return to the Main screen.

Cutter Control Instructions: Length Screen

LENGTH SCREEN

By pressing the soft key located under the word Length on the Encoder, Follower or Auto Mode Main Screen, the preset for the Length counter is available. *Additional information on how to access this screen can be found in the operator display overview in Appendix G of this manual.*



The number shown is the current length preset value, i.e. the length to cut the product. A cursor will appear in the least significant digit. The user has a choice of ways to adjust this number. Pressing the #Prst/Softkey3 accesses the number of presets to run screen. This feature is only available with the multiple preset/batch option.

Exit or Prev, if no change is required press Exit or Prev to return to the Main screen.

Raise will increase the preset by 0.010 inch. The key can be pressed once for each 0.010 inches increment required or held down to scroll up. Releasing the key will freeze the preset at the last value then press enter.

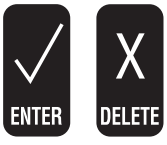
Lower will decrease the preset by 0.010 inch. The key can be pressed once for each 0.010 inch decrement required or held down to scroll down. Releasing the key will freeze the preset at the last value then press enter.

Numeric keys

Key in the length required and press enter. The decimal place is fixed so remember this when entering the preset. If you require 24 inches you must key in 24000 and then press enter. Keying only 24 will set the length to 0.024 inches.

Enter or Delete?

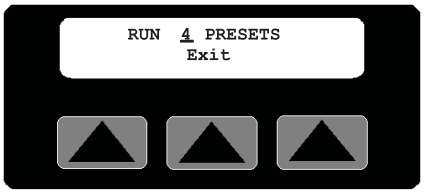
If the keyed in number is correct press the enter key for it to be accepted and return to the Main screen. If it is wrong press the delete key and the previous preset will reappear.



Cutter Control Instructions: Preset to Run Screen

PRESETS TO RUN SCREEN

By pressing the soft key located under the word #Prst on any Length Screen, the value for the number of presets to run is available. *Additional information on how to access this screen can be found on the multiple preset example in the operator display overview in Appendix G of this manual.*



The number shown is the current number of presets to run value, i.e. how many measurement presets and batches to run. The acceptable range for this value is 1 to 4. The cutter will process preset#1/batch#1 then #2 then #3 then #4 and back to #1 continuously. If a 2 is entered only preset/batch 1 and 2 are processed. A cursor will appear in the least significant digit. The user has a choice of ways to adjust this number.

Exit or Prev, If no change is required press Exit or Prev to return to the previous Length Screen.

Raise will increase the number by 1. The key can be pressed once for each increment of 1 required or held down to scroll up. Releasing the key will freeze the preset at the last value then press enter.

Lower will decrease the preset by 1. The key can be pressed once for each decrement of 1 required or held down to scroll down. Releasing the key will freeze the preset at the last value then press enter.

Numeric keys

Key in the number required and press enter. If you require 4 presets key in 4 and then press enter.

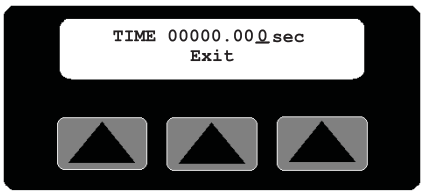
Enter or Delete?

If the keyed in number is correct press the enter key for it to be accepted and return to the Main Timer Mode screen. If it is wrong press the delete key and the previous preset will reappear.

Cutter Control Instructions: Time Screen

TIME SCREEN

By pressing the soft key located under the word Time on the Main Timer Mode Screen, the preset for the timer is available. *Additional information on how to access this screen can be found in the operator display overview in Appendix G of this manual.*



The number shown is the current time preset value, i.e. the time interval to cut the product. A cursor will appear in the least significant digit. The user has a choice of ways to adjust this number.

Exit or Prev, If no change is required press Exit or Prev to return to the Main Timer Mode Screen.

Raise will increase the preset by 0.010 second. The key can be pressed once for each 0.010 second increment required or held down to scroll up. Releasing the key will freeze the preset at the last value then press enter.

Lower will decrease the preset by 0.010 second. The key can be pressed once for each 0.010 second decrement required or held down to scroll down. Releasing the key will freeze the preset at the last value then press enter.

Numeric keys

Key in the time required and press enter. The decimal place is fixed so remember this when entering the preset. If you require 1.5 seconds you must key in 1500 and then press enter. Keying only 15 will set the time to 0.015 seconds.

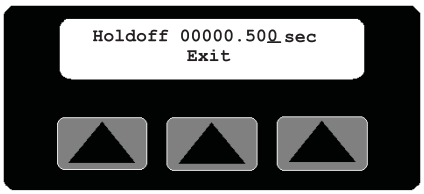
Enter or Delete?

If the keyed in number is correct press the enter key for it to be accepted and return to the Main Timer Mode screen. If it is wrong press the delete key and the previous preset will reappear.

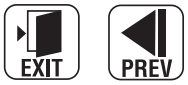
Cutter Control Instructions: Hold-Off Screen

HOLD-OFF TIME SCREEN

By pressing the soft key located under the word Time on the Main End Sense Mode Screen, the preset for the hold-off timer is available. *Additional information on how to access this screen can be found in the operator display overview in Appendix G of this manual.*



The number shown is the current hold-off time preset, i.e. the time interval to ignore the photo eye and avoid false cuts. A cursor will appear in the least significant digit. The user has a choice of ways to adjust this number.



Exit or Prev, If no change is required press Exit or Prev to return to the Main End Sense Mode Screen.

Raise will increase the preset by 0.010 second. The key can be pressed once for each 0.010 second increment required or held down to scroll up. Releasing the key will freeze the preset at the last value then press enter.

Lower will decrease the preset by 0.010 second. The key can be pressed once for each 0.010 seconds decrement required or held down to scroll down. Releasing the key will freeze the preset at the last value then press enter.

Numeric keys

Key in the time required and press enter. The decimal place is fixed so remember this when entering the preset. If you require 1.000 seconds you must key in 1000 and then press enter. Keying only 1 will set the time to 0.001 seconds and an error message will be displayed.

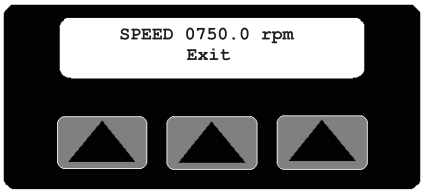
Enter or Delete?

If the keyed in number is correct press the enter key for it to be accepted and return to the Main End Sense Mode screen. If it is wrong press the delete key and the previous preset will reappear.

Cutter Control Instructions: Blade Speed Screen

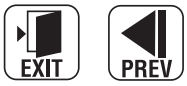
BLADE SPEED SCREEN

By pressing the soft key located under the word Blade or Speed depending on the current mode, the preset for that modes blade speed is available. *Additional information on how to access this screen can be found in the operator display overview in Appendix G of this manual.*



The number shown is the active modes current blade speed preset, i.e. the speed the blade will pass through the part. A cursor will appear in the least significant digit. The user has a choice of ways to adjust this number.

Exit or Prev, if no change is required press Exit or Prev to return to the Blade Select or Main Mode Screen.



Raise will increase the preset by 1.0. The key can be pressed once for each 1.0 increment required or held down to scroll up. Releasing the key will freeze the preset at the last value then press enter.

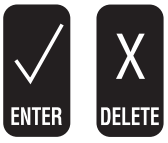
Lower will decrease the preset by 1.0. The key can be pressed once for each 1.0 decrement required or held down to scroll down. Releasing the key will freeze the preset at the last value then press enter.

Numeric keys

Key in the time required and press enter. The decimal place is fixed so remember this when entering the preset. If you require 750.0 rpm you must key in 7500 and then press enter. Keying only 750 will set the speed to 075.0 rpm and an error message with the valid range will be displayed.

Enter or Delete?

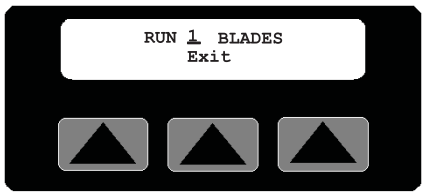
If the keyed in number is correct press the enter key for it to be accepted and return to the Blade Select or Main Mode Screen. If it is wrong press the delete key and the previous preset will reappear.



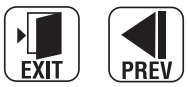
Cutter Control Instructions: Blade Count Screen

BLADE COUNT SCREEN

By pressing the soft key located under the word Blade or Count depending on the current mode, the preset for the blade count is available. *Additional information on how to access this screen can be found in the operator display overview in Appendix G of this manual.*



The number shown is the current blade count preset, i.e. the number of blades mounted to the cutter head. A cursor will appear in the least significant digit. The user has a choice of ways to adjust this number.



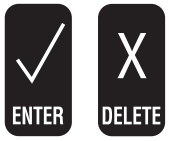
Exit or Prev, if no change is required press Exit or Prev to return to the Blade Select or Main Mode Screen.

Raise will increase the preset by 1. The key can be pressed once for each 1 increment required or held down to scroll up. Releasing the key will freeze the preset at the last value then press enter.

Lower will decrease the preset by 1. The key can be pressed once for each 1 decrement required or held down to scroll down. Releasing the key will freeze the preset at the last value then press enter.

Numeric keys

Key in the number of blades mounted and press enter. If the value entered is out of range an error message with the valid range will be displayed.

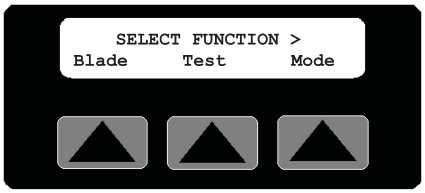


Enter or Delete?

If the keyed in number is correct press the enter key for it to be accepted and return to the Blade Select or Main Mode Screen. If it is wrong press the delete key and the previous preset will reappear.

Cutter Control Instructions: Functions Areas

FUNCTION AREAS
Additional information on how to access and navigate these screens can be found in the operator display overview section of this manual.



Menu fixed function key is used to access the Function Areas from any main mode screen. There are two Function Area screens. The user can toggle between the two screens with the Next and Prev fixed function keys.

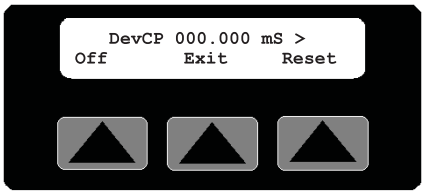
Next or Prev, Pressing Next selects the second Function Area. Pressing Prev returns the display to the first Function Area screen. Pressing Prev from the first Function Area screen returns the display to the active main mode screen.

Menus are a convenient way to access and monitor parameters that do not need to be altered often, i.e. blade speed, blade count, cut mode, repeatability test, min. allowable measurement and cuts per minute.

The most frequently used functions for a certain cutting mode are directly available from the main screen for the active mode. For a guide to screen navigation for any active mode see the operator display overview section of this manual for that mode. For information on the Blade and Parts Softkeys see their respective sections covered earlier in this manual.

Cutter Control Instructions: Test

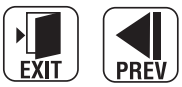
TEST SOFTKEY
Pressing soft key two located under the word Test on the first Function area screen, selects the repeatability tester.



The DevCP repeatability tester displays total deviation time in milliseconds. This time is from a cut being requested until the blade reaches the part. The smallest measured value is subtracted from the largest measured value and the resulting deviation is displayed on the screen. New data is sampled every consecutive cut. The DevCP repeatability test is available in all on-demand modes. This test is used as a tool for verifying the accuracy of the cutter.

On/Off Softkey1
On the display, on the lower left side is a soft key labeled On or Off. Pressing this key while On is displayed will reset all values and disable testing. Likewise pressing this key while Off is displayed starts the test.

Reset Softkey3
On the display, on the lower right side is a soft key labeled Reset. Pressing this key will reset all test values and start a new test.



Exit or Prev, Pressing Exit, Prev or the Softkey under the word Exit resets all values and disables testing then returns the display to the Function area screen.

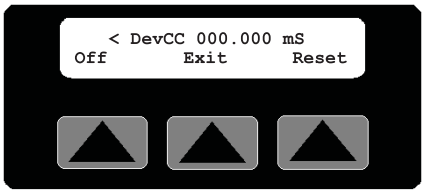
(continued)

Cutter Control Instructions: Test (continued)

Next, Pressing Next selects the DevCC test if available. If the arrow on the top right hand side of the screen is visible the current mode also supports the DevCC test.

✎ **NOTE:** The test available DevCP, DevCC or both is dependent on the active cut mode.

The DevCC repeatability tester also displays total deviation time in milliseconds. This time is from a cut being requested until the next cut request. The smallest measured value is subtracted from the largest measured value and the resulting deviation is displayed on the screen. The DevCC repeatability test is available in some on-demand modes, and all continuous modes. This test is used as a tool for verifying the accuracy of the upstream puller or the precision timer option.



On/Off Softkey1
On the display, on the lower left side is a soft key labeled On or Off. Pressing this key while On is displayed will reset all values and disable testing. Likewise pressing this key while Off is displayed starts the test.

Reset Softkey3
On the display, on the lower right side is a soft key labeled Reset. Pressing this key will reset all test values and start a new test.

Exit, Pressing Exit or the Softkey under the word Exit resets all values, disables testing then returns the display to the Function area screen.

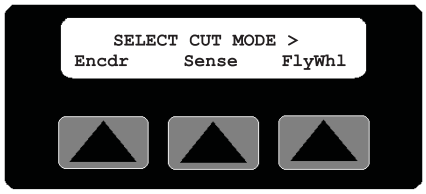
Prev, Pressing Prev selects the DevCP test if available. If the arrow on the top left hand side of the screen is visible the current mode also supports the DevCP test.

✎ **NOTE:** The test available DevCP, DevCC or both is dependent on the active cut mode.

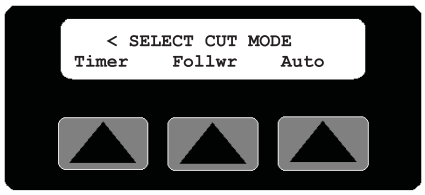
Cutter Control Instructions: Cut Mode

Mode Softkey

By pressing the soft key located under the word Mode, the different Cut Modes are available. There are two Cut Mode screens. The first screen provides choices for the standard modes available on all cutters.

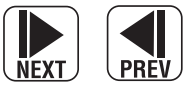


The second screen displays choices for optional cut modes. The user can toggle between the two screens with the Next and Prev fixed function keys. *Additional information on how to access this screen can be found in the operator display overview in Appendix G of this manual.*



Press the Softkey located under the cut mode desired to select that mode. If the mode is available an acknowledgment will be displayed.

This message will be displayed for 3 seconds or until any key is pressed.

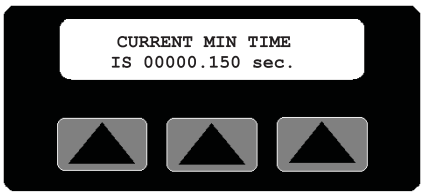


Next or Prev, Pressing Next selects the second Cut Mode Area. Pressing Prev returns the display to the first Cut Mode Area. Pressing Prev from the first Cut Mode Area screen returns the display to the Function Area screen.

Cutter Control Instructions: Minimum Measurement

Min Softkey

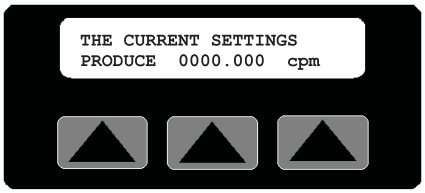
By pressing the soft key located under the word Min on the second Function Area Screen, the Minimum allowable measurement value is displayed. The active mode and the



cuts per minute limit for the model of cutter determines the actual value displayed. The screen will be displayed for 15 seconds or until any key is pressed, then return to the second Function Area screen.

CPM Softkey

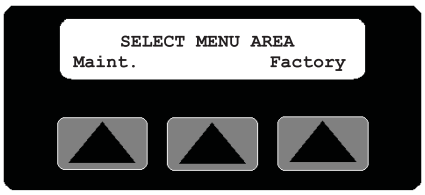
By pressing the soft key located under the word CPM on the second Function Area Screen, the calculated cuts per minute are displayed.



The active mode, measurement value, blade speed, number of blades and line speed may all contribute to determining the actual value displayed. The screen will be displayed for 15 seconds or until any key is pressed, then return to the second Function Area screen.

Cutter Control Instructions: Maintenance Area

MAINT. AREA



Menu function key is used from the first Function Area screen to access the Maintenance area. There are two menus Maint. and Factory, with access via password to various sub-menus.

Cutter Control Instructions: Encoder Area

Menus are a convenient way to access and monitor parameters that do not need to be altered often, i.e. home position, encoder direction, scale or unit of measure. In addition, preventive maintenance parameters can be monitored for trouble- shooting and scheduling purposes.

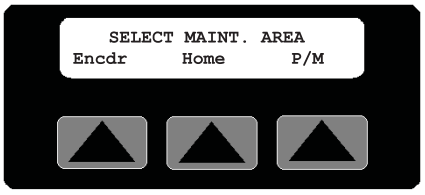
Factory Softkey
This area is password protected for factory use only.
Please do not attempt to get around the password protection as parameters beyond this point are used for calibration and setup. These parameters should only be modified by trained personal. Improper settings will reduce the performance and possibly cause severe damage to your machine.

Maint. Softkey
Located under the word Maint. is the Maintenance soft key. The Maintenance area is password protected. This area should only be accessed by qualified personal.

After pressing the Maintenance Softkey, the password entry screen is displayed. With the numeral keys press 6 2 0 9 then the Enter key to access the maintenance area. An improper password will cause the message below to be displayed for 3 seconds.

```
THE PASSWORD ENTERED
    WAS INCORECT!
```

There are three sub-menus, Encdr, Home, and P/M accessible in the maintenance area.

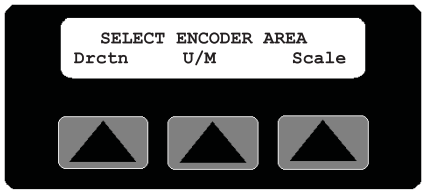


Exit or Prev, Pressing Exit or Prev will return the display to the Menu Area screen.

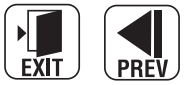
(continued)

Cutter Control Instructions: Encoder Area (continued)

Encdr Softkey
By pressing the soft key located under the word Encdr on the Maint. Area Screen, there are three sub-menus, Drctn, U/M, and Scale accessible. Additional information on how to access this screen can be found in the Maintenance Area of the operator display overview section of this manual.

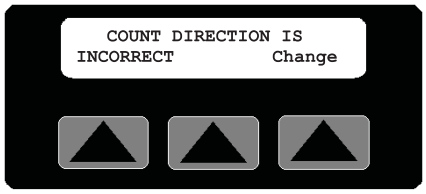


Exit or Prev, Pressing Exit or Prev will return the display to the Maint. Area screen.

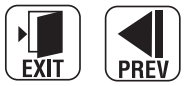


Cutter Control Instructions: Encoder Direction

DIRECTION SOFTKEY
By pressing the soft key located under the word Dirctn on the Encdr. Area Screen, the direction of the encoder rotation can be changed. Located on the lower left side of the display is the status text (INCORRECT/CORRECT) for the encoder direction.



Exit or Prev, Pressing Exit or Prev will return the display to the Encoder Area screen.



Change Softkey
With the machine stopped, by pressing the soft key located under the word Change. The direction of the encoder is reversed. After the change if the count direction is positive, the status text will now display the word CORRECT.

Attempting to change the encoder direction with the cutter running will result in the following message.

```
THE CUTTER MUST BE
STOPPED TO CHANGE!
```

This message will be displayed for 3 seconds or until any key is pressed. Press stop on the operator panel then try again.

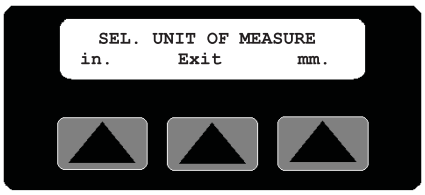
(continued)

Cutter Control Instructions: Encoder Direction (continued)

If a negative symbol is shown to the left of the count value on the main mode screen the encoder signal is reversed, i.e. rotating in the wrong direction. The Cutter will not function while the encoder is going negative. The direction function corrects this by changing what the servo drive interprets as a positive direction, CW or CCW rotation.

Cutter Control Instructions: Unit of Measure

UNIT OF MEASURE SOFTKEY
By pressing the soft key located under the word U/M on the Encoder Area screen, the Eng. Units can be set.



Exit or Prev, Pressing Exit or Prev will return the display to the Encoder Area screen.

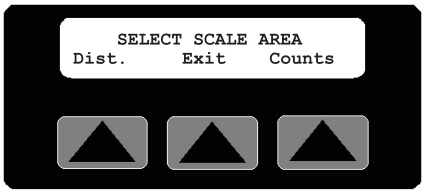
in./mm. Softkeys
Pressing the soft key located under in. or mm. Changes all displayed measurements to the respective unit of measure.
The scaled distance must now be set for the desired unit. See the Scale Area Dist. Softkey description.

(continued)

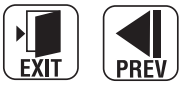
Cutter Control Instructions: Unit of Measure (continued)

Scale Softkey

By pressing the soft key located under the word Scale on the Encoder Area Screen, there are two sub-menus, Dist., and Counts accessible. *Additional information on how to access this screen can be found in the Maintenance Area of the operator display overview in Appendix G of this manual.*



Exit or Prev, Pressing Exit or Prev will return the display to the Encoder Area screen.



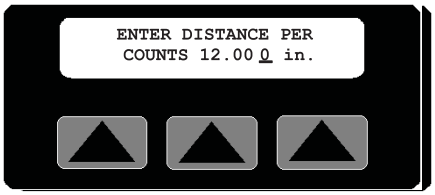
SETTING THE SCALE FACTOR

The Encoder mode uses a scale factor to compensate for configurations that differ from the standard (a measuring wheel with a 1 foot circumference; a 3000 bi-directional quadrature pulse encoder; and English units of measure). The prescale value is set at the factory for your equipment and typical unit of measurement. However, it may occasionally be necessary to adjust the prescale value.

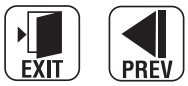
Cutter Control Instructions: Scale Distance

DISTANCE SOFTKEY

By pressing the soft key located under the word Dist. on the Scale Value Screen, the scaled distance is available. This value must be set after a U/M change. *Additional information on how to access this screen can be found in the Maintenance Area of the operator display overview in Appendix G of this manual.*



The number shown is the current distance value, i.e. the circumference of the measuring wheel or distance per revolution of the encoder. A cursor will appear in the least significant digit.



Exit or Prev- if no change is required press Exit or Prev to return to the Scale Value screen.

Raise will increase the value by 0.001inch. The key can be pressed once for each 0.001inch increment required or held down to scroll up. Releasing the key will freeze the value at the last value.

Lower will decrease the value by 0.001inch. The key can be pressed once for each 0.001inch decrement required or held down to scroll down. Releasing the key will freeze the value at the last value.

Numeric keys

Key in the distance desired and press enter. The decimal place is fixed so remember this when entering the value. If you require 12.000 inches you must key in 12000 and then press enter. Keying only 12 will set the distance to 0.012 inches.

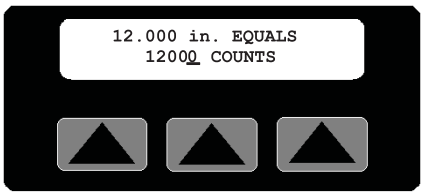
Enter or Delete?

If the keyed in number is correct press the enter key for it to be accepted and return to the Scale Value screen. If it is wrong press the delete key and the previous value will reappear.

Cutter Control Instructions: Scale Counts

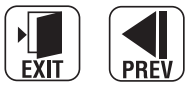
COUNTS SOFTKEY

By pressing the soft key located under the word Counts on the Scale Value Screen, the scaled counts are available. *Additional information on how to access this screen can be found in the Maintenance Area of the operator display overview in Appendix G of this manual.*



The number shown is the current count value, i.e. the pulses per revolution of the encoder. For example a 3000 pulse quadrature encoder will produce 3000 x 4 channels or 12000 counts. A cursor will appear in the least significant digit. The user has a choice of ways to adjust this number.

Exit or Prev, if no change is required press Exit or Prev to return to the Scale Value screen.



Raise will increase the value by 1. The key can be pressed once for each 1 increment required or held down to scroll up. Releasing the key will freeze the value at the last value.

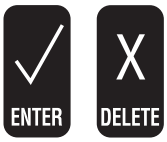
Lower will decrease the value by 1. The key can be pressed once for each 1 decrement required or held down to scroll down. Releasing the key will freeze the value at the last value.

Numeric keys

Key in the count desired and press enter. If you require 12000 counts you must key in 12000 and then press enter.

Enter or Delete?

If the keyed in number is correct press the enter key for it to be accepted and return to the scale value screen. If it is wrong press the delete key and the previous value will reappear.



Cutter Control Instructions: Homing

HOMING

A defined Home location is required for all servo-positioning applications. After initial power up, emergency stop or guard opened, home position must be found. All motion is relative to this home position. The home cycle occurs once after power is applied to the servo drive in response to the Start push button being pressed. The cutter head rotates towards the home sensor at the programmed on-demand blade speed. After the home sensor has been found, the cutter head will decelerate and stop at the specified offset position. This position is then set to 0.0 degrees at the end of the home sequence. If the home sensor is not found in one revolution of the cutter head, the following message is displayed on the operator.

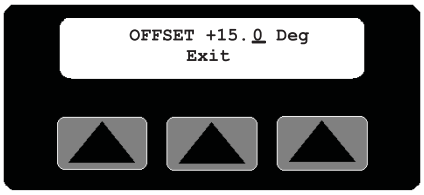
The sensor may be faulty, have a loose connection or be improperly adjusted. Press any key on the operator to acknowledge the fault. Disconnect power, fix the problem then restart the cutter.

After a successful home has been completed, if the cutter is stopped away from the home position and the power to the machine is left on, the cutter head position is still known. When the cutter is restarted, the cutter head will return at the programmed On-Demand blade speed to the home position.

Cutter Control Instructions: Home Offset

HOME OFFSET SCREEN

By pressing the soft key located under the word home on the Maintenance Screen, the offset for the home position is available. *Additional information on how to access this screen can be found in the Maintenance Area of the operator display overview in Appendix G of this manual.*

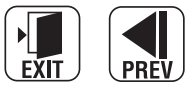


The number shown is the current offset value, i.e. the distance from position zero. A cursor will appear in the least significant digit. The user has a choice of ways to adjust this number.

(continued)

Cutter Control Instructions: Home Offset (continued)

Exit or Prev, If no change is required press Exit or Prev to return to the Maintenance Area screen.

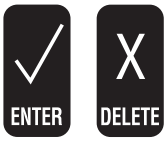


Raise will increase the value by 1.0. The key can be pressed once for each 1.0 increment required or held down to scroll up. Releasing the key will freeze the value at the last value.

Lower will decrease the value by 1.0. The key can be pressed once for each 1.0 decrement required or held down to scroll down. Releasing the key will freeze the value at the last value.

Numeric keys
Key in the distance desired and press enter. The decimal place is fixed so remember this when entering the value. If you require 15.0 degrees you must key in 150 and then press enter. Keying only 15 will set the distance to 01.5 degrees.

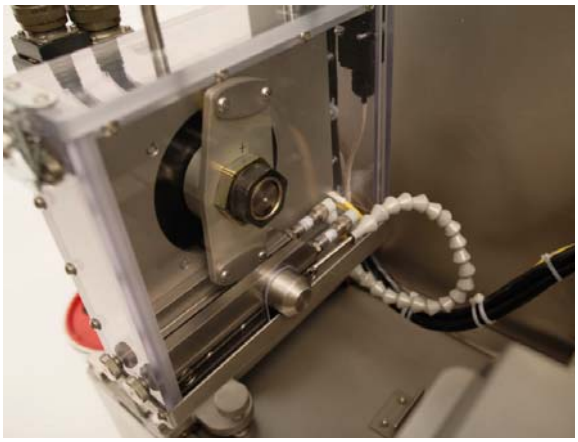
Enter or Delete?
If the keyed in number is correct press the enter key for it to be accepted and return to the Maintenance Area screen. If it is wrong press the delete key and the previous value will reappear.



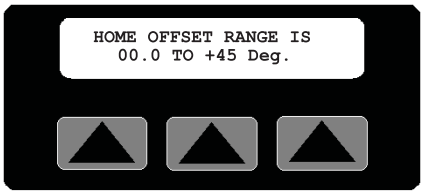
Cutter Control Instructions: Offset Example

Home Offset Example

With the Cut Enable on/off turned off and the cutter started, entering a new value at the Home Offset screen will initiate a home routine using the new value.
The graphic example above demonstrates the resulting home position with a 15 degree offset.



The acceptable range for this value is 00.0 to +45.0 degrees. Making an entry outside of this range generates the following error message on the operator display.

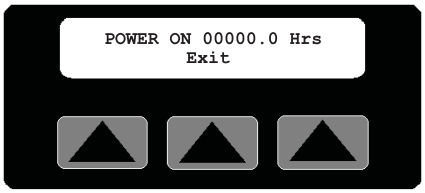


After 5 seconds or if any key is pressed the display returns to the Home Offset

Cutter Control Instructions: Power On Time

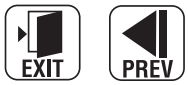
TIME SOFTKEY

Pressing the soft key located under the word Time on the P/M area screen, selects the Power-On time screen.



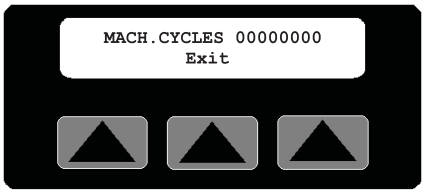
The Power-On time screen displays the total time in hours that the machine has had the power switched on. This information could be used for scheduling preventive maintenance. The displayed time can not be reset.

Exit or Prev, Pressing Exit, Prev or the Softkey under the word Exit returns the display to the Select P/M area screen.



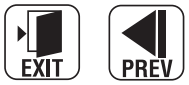
Cycles Softkey

Pressing the soft key located under the word Cycles on the P/M area screen, selects the machine cycles screen.



The Machine Cycles screen displays the absolute total cuts that the machine has made since manufacture. This information could be used for scheduling preventive maintenance. The displayed count can not be reset.

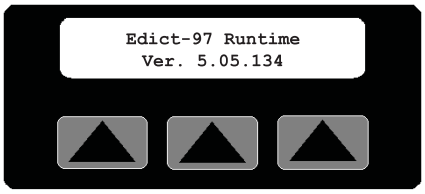
Exit or Prev, Pressing Exit, Prev or the Softkey under the word Exit returns the display to the Select P/M area screen.



Cutter Powering Up

Power Up Sequence

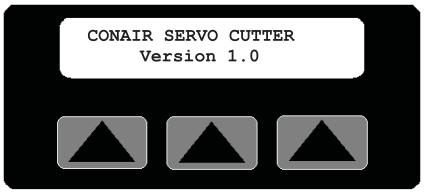
At power up a series of system screens briefly appear. The software is Red Lion's Edict-97. This screen or similar shows first.



Next, the Communications message appears

If there are any problems with communications, this screen will remain on longer than a couple of seconds.

If there are no communication problems the Conair Combination Puller/Cutter program will begin to run. The following message or similar shows for 5-seconds.



After the 5 second delay the Main Screen will appear.

Puller Operation Control

1 **Apply power to the machine.** Place the disconnect in the "ON" position.

2 **Open the gap** between the puller belts to the desired gap for the product to be pulled.

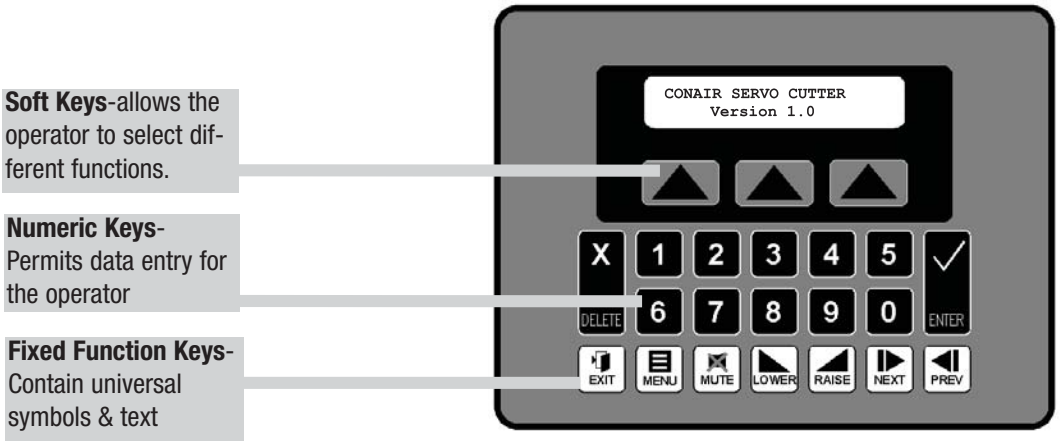
3 **Depress the green "START" button** to start the drive.

✎ **NOTE:** If the puller does not start, make sure the "Emergency Stop" button is pulled out in the extended position.

Puller Operator Control Features

The Operator Control provides an intuitive user-friendly method to interface with the Conair Servo Puller. Information is viewed and entered at the Operator Control and is communicated to the servo positional amplifier via the RS-232 serial communication link.

The Operator Control is a flat membrane panel consisting of 22-keys and a large 2 line x 20 back lit LCD screen.



Soft Keys

Soft keys - these are the three keys directly under the display. All three have a triangle on them. Occasionally, pages will appear that allow the operator to use one of the soft keys. On those occasions, text would typically appear directly above the key and the key will have a function. Think of the text as the soft key function indicator or title. These keys will be referred to in this manual from left to right as soft keys 1, 2 and 3 respectively.

Numeric Keys

These are the black keys containing numbers 0 to 9. Numbers permit data entry of parameters. See Raise and Lower for value trim.

Fixed Function Keys (at Bottom)

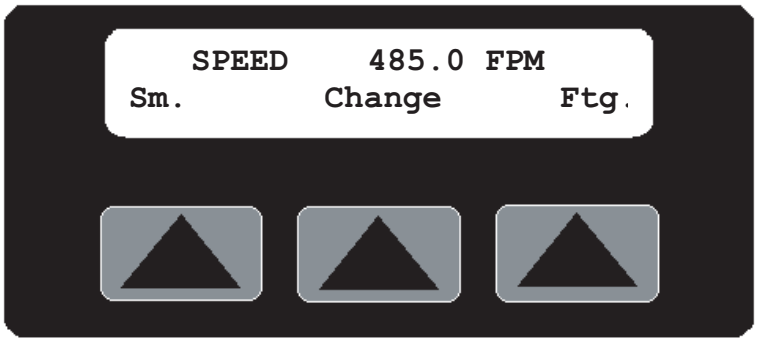
Underneath the numeric keys are fixed function keys. They contain universal symbols and text. The fixed function keys are Raise, Lower, Next, Prev (previous), Enter, Delete, Exit, Menu and Mute. These functions are described in the "Function keys - Fixed Functions" section of this manual.

LCD Screen

The screen shows various pages depending on operator actions. In addition, it is used to indicate warnings. Mostly, it is used for viewing status and for setting parameters.

Puller Operator Control Instructions: Main Screen

MAIN SCREEN
When the puller is first powered up, the following screen will appear after 5 seconds. The type displayed varies depending on the current puller setting.



The Main Screen has 3 features. The top line displays the current puller speed and is measured in feet per minute (FPM). The bottom line contains three soft key functions, softkey1/Scroll Increment, softkey2/Operator Entered Speed Changes and softkey3, Footage Counter.

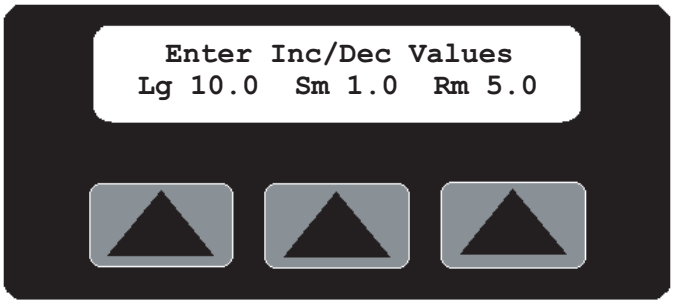
Scroll Increment Softkey
Puller speed adjustment can be done by programming the Scroll Increment preset. Scroll increments can be set for course or fine adjustments. *See Operation Section entitled, Puller Operator Control Instructions: Programming Scroll Increments.*

Operator Entered Speed Change Softkey
Puller speed can be entered manually by the user through this preset. *See Operation Section entitled, Puller Operator Control Instructions: Entering the Puller Speed.*

Footage Counter Softkey
Pressing the Footage Counter Softkey will display the current running footage of the puller. *See Operation Section entitled, Puller Operator Control Instructions: Footage Counter.*

Puller Operator Control Instructions: Programming Scroll Increments

The Scroll Increment Screen provides programmable preset scroll increments for puller speed. Increments are set for course (Lg), fine (Sm) and remote (Rm) scroll adjustments.



To adjust scroll increments:

1 Press the "Menu" button.

2 Key in the new Course (Lg.) increment preset using the numeric keypad. When accessing this screen the cursor will always start at the Course (Lg) least significant decimal point. For example, to change the Lg scroll increment to 5 feet per minute, enter "5 0".

3 Use the "Enter" button or the "Next" and "Prev" buttons to move to other scroll increment presets. The least significant decimal point will be highlighted when moving between scroll increment presets. After entering the new remote (Rm) preset, pressing the "Enter" button will exit this page and return the operator to the Main Screen.

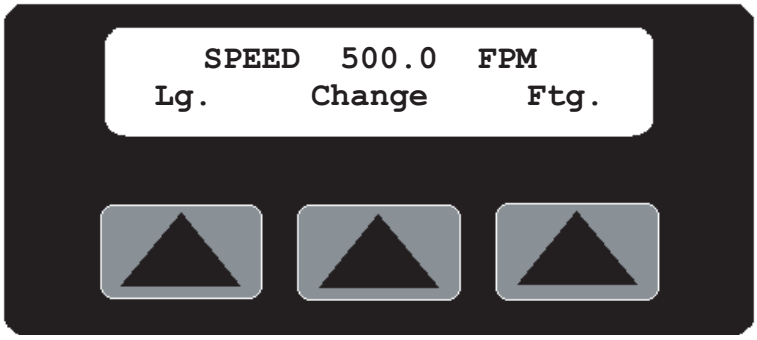
4 Press the "Exit" button from any point in the Scroll Increment Screen to return to the Main Screen.

Value Ranges for Scroll increments:

- **Lg (Course)** = 0-99.9 feet per minute per contact (Default = 10.0)
- **Sm (Fine)** = 0-9.9 feet per minute per contact (Default = 1.0)
- **Rm (Remote Pot)** = 0-99.9 feet per minute per contact (Default = 5.0)

Puller Operator Control Instructions: Using Scroll Increments

Lg (Course) and Sm (Fine) puller scroll increments are used to adjust the puller's speed (FPM). Each preset is programmed to increase or decease the puller's speed by a user specified amount. Rm (Remote) can only be used with the optional Puller Speed Remote. *See Operation Section entitled, Puller Operator Control Instructions, Puller Speed Remote.*



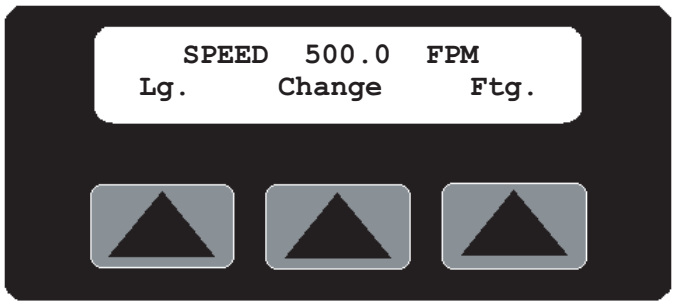
To adjust the puller's speed using scroll increment presets:

1 **Press the Scroll Increment Softkey/Softkey 1 to toggle through the types of scroll increments.** Typically, the Lg (Course) setting is used when starting an extrusion line, while Sm (Fine) is used to fine-tune the puller speed.

2 **Use the "Raise" and "Lower" buttons to increase or decrease the puller speed** by the increment selected. (Lg, Sm)

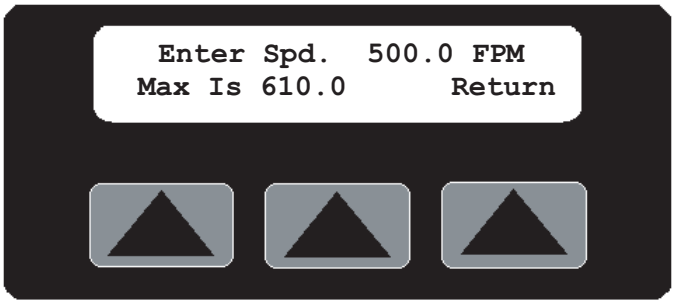
Puller Operator Control Instructions: Operator Entered Speed Change

Puller speed can be entered manually by using the Operator Entered Speed Change Softkey/Softkey 2 and entering the new puller speed with the controller's numeric keypad.



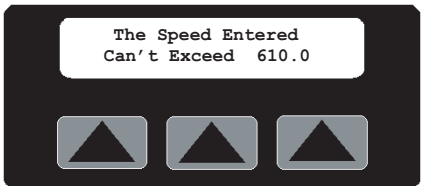
To enter a new puller speed:

1 **Press the Operator Entered Speed Change Softkey/Softkey 2.**



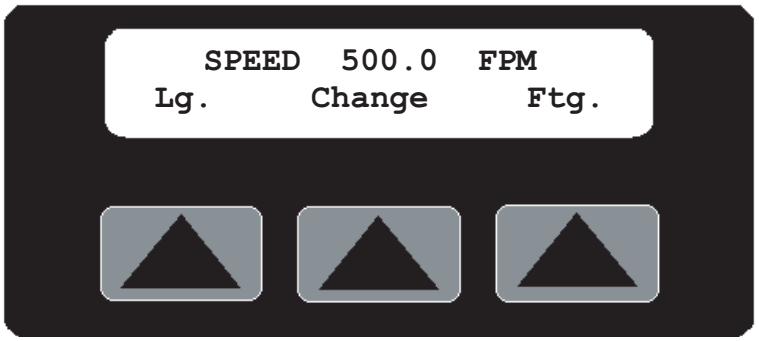
2 **Use the control keypad to enter the new puller speed.** The display window will show the new puller speed and the maximum achievable puller speed. To enter 500 FPM, press 5 - 0 - 0 - 0, the controller's cursor will start at the least significant decimal point.

3 **Press the "Enter" button to confirm the new puller speed.** If the maximum puller speed is exceeded, a message will be displayed. Press the "Enter" button to return to the previous screen, enter a new puller speed and press either the "Enter" button or The Return Softkey.



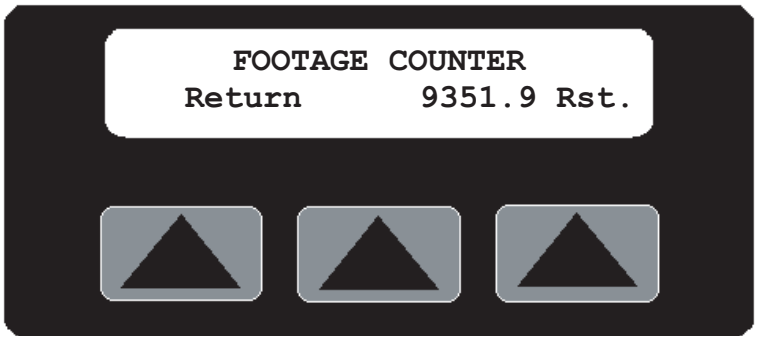
Puller Operator Control Instructions: Footage Counter

The Footage Counter provides a digital readout of the total footage of material that has passed through the puller. The counter can be reset at any time, suppling a current readout of total footage.



To view or reset the footage counter:

1 Press the Footage Counter Softkey/Softkey 3.

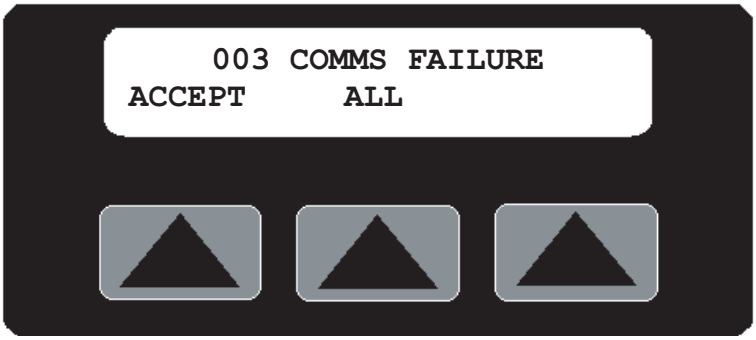


2 Press the softkey directly under "Rst." to reset the Footage Counter. This will "zero" the counter and Footage Counter will start counting the new footage.

3 Press the softkey directly under "Return" or press the "Exit" key to return to the Main Screen.

Puller Operator Control Instructions: Diagnostics Screen

There are three servo puller control system diagnostics screen. *Refer to the Servo Drive and Amplifier manuals which came with your belt puller to service your system.* The servo amplifier will have a window with letters or numbers to represent operational conditions.



To acknowledge and clear a fault:

1 **Correct the fault.** There are three servo system diagnostic screen displays: 001 - Drive Fault, 002 - Drive Torque Limit Exceeded, 003 - Communication Failure. *Reference the Servo Drive and Amplifier manuals that came with the puller for specific causes and solutions for each fault.*

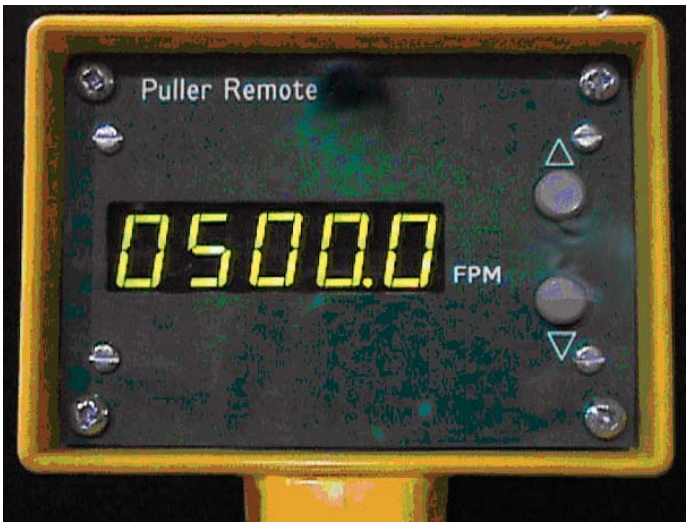
2 **Acknowledge the fault or faults, by pressing the "Accept" or "All" Softkey.** Specific faults can be acknowledge by pressing the softkey directly under the word "Accept". Multiple faults can be acknowledged by pressing the softkey directly under the word "All".

✎ **NOTE:** If the fault is not acknowledged, even if the fault was corrected, the display will not return to the Main Screen.

3 **The control display will return to the Main Screen after the fault has been corrected and acknowledged.**

Puller Operator Control Instructions: Puller Speed Remote (Optional)

The optional Puller Speed Remote is used upstream on an extrusion line to correct puller speed. The increment of change used is set at the Scroll Increment Screen. *See Operation Section entitled, Puller Operator Control Instructions: Programming Scroll Increments.*



To change puller speed using the Puller Speed Remote:

1 **Press the "Up" or "Down arrow buttons located on the right side of the controller to adjust the puller's speed.** Holding down either button will increase or decrease the puller speed one scroll increment for every second the button is depressed. The display will show the current puller speed (FPM).

Before Starting Combination Unit

Before you start daily operation of the Combination Puller/Cutter, you need to perform preventative maintenance. *Necessary maintenance is described in the Maintenance section of this Users Guide.*

⚠ **WARNING:** Be sure that power to the puller/cutter is OFF when doing any maintenance on the puller/cutter. Follow all safety rules when performing any maintenance on this equipment.

Daily maintenance includes:

- Inspecting the puller belt
- Inspecting the cutter blades
- Inspecting the blade mounting hardware
- Making sure the cutter bushings are properly secured
- Inspecting the closure latch on the knife guard
- Checking alignment with extrusion line
- Performing any floor lock adjustments as needed

These items and weekly, monthly, and semi-annual maintenance procedures are detailed in the Maintenance section of this User Guide.

⚠ **DANGER: Pinch Hazard**

Never remove or disable safety devices to sustain production. Operating without these devices could lead to hazardous conditions that can cause severe injury. Take all necessary precautions when working around moving parts to prevent body parts and clothing from being pulled into the machine.

Start-Up Preparations for Puller

If you have not already done so, perform daily maintenance check, power up the puller/cutter, select the cutting mode and blade speed and make a test cut to check cut quality.

Use the slide system to move the cutter as far from the puller as possible:

1 **Loosen the turnbuckle** below the puller/cutter by turning 1-2 turns clockwise.

2 **Slide the cutter as far downstream as it will go.**

3 **Tighten the turnbuckle** by turning it counterclockwise.

⚠ **WARNING: Improper Installation, operation, or servicing may result in Equipment damage or personal injury.**

This equipment should only be installed, adjusted, and serviced by qualified technical personnel who are familiar with the construction, operation, and potential hazards of this type of machine.

All wiring, disconnects, and fuses should be installed by qualified electrical technicians in accordance with electrical codes in your region. Always maintain a safe ground. Do not operate the equipment at power levels other than what is specified on the machine serial tag and data plate.

1 **Locate puller on the extrusion line** with the floor support pads adjusted to the product centerline.

✎ **NOTE:** Never operate belt puller on casters only.

2 **Be sure power supply matches** specified belt puller power before connecting. If unsure, please do not hesitate to call for service.

3 **Adjust the belt puller** entrance guide rolls to insure consistent product guidance.

4 **Adjust the belt** opening to allow consistent traction to the product without deformation.

(continued)

Start-Up Preparations for Puller

(continued)

⚠ **DANGER: Moving Parts Hazard**

Take all necessary precautions when working around moving parts to prevent body parts and clothing from being pulled into the machine.

Always disconnect and lock out the main power source before performing maintenance on the puller.

Never remove or disable safety devices to sustain production. Operating without these devices could lead to hazardous conditions that can cause severe injury.

Before you start daily operation of the puller, you should:

- ❒ Inspect the puller belts.
- ❒ Check puller alignment with the extrusion line.
- ❒ Assure the floor locks are properly engaged.
- ❒ Thread the extrudate through the sizing equipment, puller and an other devices on the extrusion line puller.

See the Maintenance section of this User Guide for detailed information on daily maintenance procedures.

1. **Plug in the power cord** to restore power after any required maintenance.

2. **Turn on power to the puller.** Plug in the power cord to restore power after performing any required maintenance. Turn the main disconnect to the ON position.

3. **Press the green Start button for the puller.** If the puller does not start, make sure the “Emergency Stop” button is pulled out in the extended position.

4. **Set the puller speed.**

5. **Observe line speed.** (standard)

Powering Up the Cutter

1 **Plug in the power cord** to restore power after any required maintenance.

2 **Turn on the main power.** The cutter control will start up. The amber power on light illuminates. (Two line HMI only)

✎ **NOTE:** You can watch the servo motor amplifier's status screen during start up through the window on the back of the electrical enclosure. This display gives information that may be useful if you have a problem. See the *Troubleshooting section* of this manual.

While the cutter is booting up, perform the next three steps:

3 **Make sure the "Emergency Stop" button is in the out, extended position.**

4 **Make sure that the Cut Enable is Off.**
If necessary, press button to display off.

5 **Press "Start Cutter" button.** The cutter head will make one revolution until it finds its home offset position.

✎ **NOTE:** If "Home Runtime Failed" message is displayed or if you receive a "Home Failed (Sensor may be damaged" on the Faults Page on the touch panel HMI. Check for malfunctions of misadjusted sensor.

6 **Open the knife guard.** The light in the push button will go out or the cutter status on the Main Page will show "Stopped" in red.

If the cutter is not working properly at any time, turn it off immediately and refer to the *Troubleshooting section* of this User Guide.

If you do not encounter any problems, proceed to the Operation section.

Programming the Puller Speed

After powering up the combination puller/cutter, you need to set the puller speed. *See Operation Section entitled, Setting Puller Speed and Puller Operator Instructions, Operator Entered Speed Change and Using Scroll Increments.*

✎ **NOTE:** *See Operation Section entitled, Angles Page Description* for steps to cut and park angles if using Red Lion HMI and Control Techniques/ Emerson Servo Drives

Starting the Puller

⚠ **DANGER: Moving Parts Hazard**

Take all necessary precautions when working around moving parts to prevent body parts and clothing from being pulled into the machine.

Always disconnect and lock out the main power source before performing maintenance on the puller.

Never remove or disable safety devices to sustain production. Operating without these devices could lead to hazardous conditions that can cause severe injury.

Before you start daily operation of the puller, you should:

- ❒ Inspect the puller belts.
- ❒ Check puller alignment with the extrusion line.
- ❒ Assure the floor locks are properly engaged.
- ❒ Thread the extrudate through the sizing equipment, puller and an other devices on the extrusion line puller.

See the Maintenance section of this User Guide for detailed information on daily maintenance procedures.

1. **Plug in the power cord** to restore power after any required maintenance.

2. **Turn on power to the puller.** Plug in the power cord to restore power after performing any required maintenance. Turn the main disconnect to the ON position.

3. **Press the"Puller Start" button.** If the puller does not start, make sure the "Emergency Stop" button pulled out in the extended position.

4. **Observe the digital line** rate indicator to observe line speed. (standard)

Stopping the Puller

⚠ **WARNING: Safe Stopping**

Do not use any part of the rotary disconnect to stop the belt puller. Use the recommended procedure to assure a safe stopping.

1 **Remove extrudate from the puller**.

2 **Press the "Puller Stop" button**.

3 **Turn rotary disconnect to OFF**.

Shutting Down the Puller

To shut down the puller, perform the stopping procedure listed above. No additional steps are necessary if the puller is shut down for short period of time.

If the puller is shut down for an extended period of time, belts can acquire "set." If this occurs, let the puller run for 20-30 minutes before use. This should remove any "set" from the belts.

Combination Control Features

There are seven buttons below the Cutter Control and Puller control. They are:

- **Cutter Power On/Off**
  Turn the Cutter Power On/Off to shut down the cutter portion of the combination for blade replacement, etc., without shutting down the puller portion.

- **Cutter Start button**
  Pressing this button energizes the cutter portion.

- **Cutter Stop button**
  Press this button to shut down the cutter portion.

- **Manual Cut button**
  Press this button to make a manual cut with the cutter portion.

- **Emergency Stop button**
  Press to stop the combination Puller/Cutter in an emergency.

- **Puller Start button**
  Pressing this button energizes the puller portion.

- **Puller Stop button**
  Press this button to shut down the puller portion.

✎ **NOTE:** *See Operation Section entitled, Scale Page Description* for steps to change cutter and puller modes if using Red Lion HMI and Control Techniques/ Emerson Servo Drives.

Setting the Scale Factor

The Encoder Mode uses a scale factor to compensate for configurations that differ from the standard (a measuring wheel with a 1 foot circumference; a 3000 pulse encoder; and English units of measure). The prescale value is set at the factory for your equipment and typical unit of measurement. However, it may occasionally be necessary to adjust the prescale value.

✎ **NOTE:** *See Operation Section entitled, Scale Page Description* for steps to change cutter and puller modes if using Red Lion HMI and Control Techniques/ Emerson Servo Drives.

Checking Cut Quality

1 **Press the "Manual Cut" button** and observe the movement of the cutter blade. The cutter head makes a single rotation and the blade moves through the cutter bushings without interference.

2 **Insert a piece of extrudate through the cutter bushings.**

3 **Press the "Manual Cut" button.** A single cut is made at the preset blade speed.

✎ **NOTE:** this works even if Cut On/Off is off.

4 **Inspect the cut.** If necessary, adjust the blade design or blade speed. *See Appendix B: All About Cutter Blades*.

When you are satisfied with cut quality, press the Cut On/Off SoftKey and ON is displayed, automatic operation begins.

✎ **NOTE:** Press the "Cutter On" button if using Red Lion HMI and Control Techniques/ Emerson Servo Drives

When the extrudate is running within tolerance, cut it with a knife or saw and feed it through the cutter bushings. Then move the cutter into position with respect to the puller:

- **For flexible products,** the cutter should be very close to the puller.
- **For more rigid products,** allow enough space between the cutter and puller to absorb any shock generated during cutting.

Setting the Cut Mode
Two-Line HMI Interface Operation

1 **Be sure that the Cut On/Off button is OFF.**

2 **Press the Select button** to activate the cutting mode you want. A mode is active when the LED next to it is lit. Each time you press Select the control activates the next available mode. Continue pressing the Select button until you get the mode you want. Then go on to the next step.

3 **Make any additional entries** required for the cutting mode you have selected. Press the Set button. Use the adjustment arrows to change the number listed on the Length or Time display. Press Set button to return to normal operating mode.

- **For Timer Mode:** Use the Set button and Adjustment arrows to change the time (in seconds, to three decimal places). NOTE: the decimal point cannot be moved.
- **For Encoder Mode:** Use the Set button and Adjustment arrows to change the cut length. If the cut length does not equal the set length, adjust the prescale value. *See Operation Section entitled, Encoder Area.*
- **For Product Mode:** Use the Set button and Adjustment arrows to change the hold-off time. In Product mode, the desired length is set by the electric eye that sense the end and initiate a new cut. To prevent unwanted double cuts, a hold-off (or one-shot) timer is built into the cutter control. After a cut is made, the hold-off time displays in the Display window (in seconds, to three decimal places) and begins counting down to zero. No cutting occurs until the countdown is completed. Make sure the new value is less than the time between cuts. NOTE: 70-80% of the expected time between cuts is recommended.
- **For Flywheel Mode:** Use the Set button and Adjustment arrows to change the cutter blade speed. If you are not sure what blade speed to use, start fast and work your way down to slower speeds. *See Appendix B: All About Cutter Blades.*
- **For Follower Mode:** Press the Blade Speed button; use the Adjustment arrows to enter the number of blades (1, 2, 4, or 8). Press the Set button to accept the value. Use the Set button and Adjustment arrows to set the cut length.

NOTE: *See Operation Section entitled, Modes Page Description* for steps to change cutter and puller modes if using Red Lion HMI and Control Techniques/ Emerson Servo Drives.

✎ **NOTE:** *See Operation Section entitled, Modes Page Description* for steps to change cutter and puller modes if using Red Lion HMI and Control Techniques/ Emerson Servo Drives.

Making Adjustments During Operation for the Cutter

There are several adjustments you can make during normal cutting. These adjustments include:

- **In Timer Mode**, adjust the time between cuts
- **In Encoder and Follower Modes**, adjust the length
- **In Product Mode,** adjust the hold-off time
- **In Flywheel Mode,** adjust blade speed (CSC only)
- **Adjust blade speed in all modes except Follower**

- **Perform a manual cut and reset the length** by pressing the manual cut button at any time during on-demand cutting. Pressing Reset/Test has no effect during continuous cutting.

  ✎ *See Operation Section entitled, Using Cutter Control, Setting Cut Length* for steps to change cutter and puller modes if using Red Lion HMI and Control Techniques/Emerson Servo Drives.

- **Count the total number of cuts** by pressing the Total On/Off soft key. Use the Reset button to return the count to zero. This feature is useful for collecting samples during a production run.

  ✎ *See Operation Section entitled, Using Total and Batch Counter* for steps to change cutter and puller modes if using Red Lion HMI and Control Techniques/Emerson Servo Drives.

✎ **NOTE:** While the controller will allow you to switch modes during operation, this is not recommended.

- **Count the batches of cuts** by pressing the Total On/Off soft key. Use the Reset button to return the count to zero. This feature is useful for collecting samples during a production run.

  ✎ *See Operation Section entitled, Using Total and Batch Counter* for steps to change cutter and puller modes if using Red Lion HMI and Control Techniques/Emerson Servo Drives.

- **Stop cutting temporarily** by setting Cut On/Off to off. This allows you to view the cutting blade (through the window) or perform other tasks without shutting down the cutter.

Stopping Only the Cutter

You can shut down just the cutter portion of the combination puller/cutter if you need to change or adjust cutter blades:

1 **Press Cut On/Off Softkey** to Off to stop cutting.

✎ **NOTE:** Press the "Cutter Off" button if using Red Lion HMI and Control Techniques/ Emerson Servo Drives

2 **Press Stop Cutter button** to disable the servo motor.

3 **Turn Cutter Power On/Off switch to Off.** Power is no longer supplied to the cutter portion of the combination puller/cutter. The belt puller will continue running.

See Installation Section entitled, Installation Cutter Blades.

Stopping the Combination Puller/Cutter

⚠ **WARNING: Never use any part of the guard circuit or the rotary disconnect to stop the combination puller/cutter.**
This can cause damage to the equipment and injury to personnel. Use the recommended procedure to assure safe stopping.

To safely stop the Combination Puller/ Cutter:

1 **Press Cut On/Off Softkey** to Off to stop cutting (Softkey text changes to off).

✎ **NOTE:** Press the "Cutter Off" button if using Red Lion HMI and Control Techniques/ Emerson Servo Drives

2 **Press "Stop Cutter" button** to disable the servo motor.

3 **Remove extrudate from both puller and cutter.**

4 **Press the "Puller Stop" button.**

5 **Turn the rotary disconnect to the off position.**

⚠ **WARNING: Never turn off the rotary disconnect first.**
Doing so will turn off all power to the unit, and the cutter will not be brought to a controlled stop. For safe stoping, always follow the sequence given above.

6 **Disconnect the power cord** if it is equipped with a plug on the end.

7 **Lock out the rotary disconnect.**

8 **Clean the Particulate Tray at the bottom of the blade guard** if you are shutting down the combination puller/cutter for the day.

Shutting Down the Puller/Cutter

To shut down the combination puller/cutter, perform the stopping procedure listed above. No additional steps are necessary if the combination puller cutter is shut down for short period of time. If the unit is shut down for an extended period of time, puller belts can and do acquire 'set.' If this occurs, let the puller run for 20-30 minutes before use. This should remove any set from the belts.

SECTION
5

Maintenance

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Maintenance Features

The Servo Cutter CSC combo model needs regular, scheduled maintenance for peak performance. Among the features that require maintenance are:

- Puller belts
- Cutter blades
- Blade mounting hardware
- Cutter bushings
- The knife guard hardware
- Floor locks
- Lubrication
- Optional slide rail system
- Electrical cables, terminals and control lights
- Equipment alignment

Warnings and Cautions

To maintain the best performance of the Combination Puller/Cutter, it must be cleaned and inspected regularly. Maintenance includes a daily, weekly, quarterly, and semi-annual (every 6 months) schedule.

Use this maintenance schedule as a guide. You may need to shorten the time of the maintenance schedule, depending on how often you use the servo cutter, and the types of material flowing through it. Follow all precautions and warnings when working on the equipment.

⚠ **WARNING: Improper Installation, operation, or servicing may result in equipment damage or personal injury.**

This equipment should only be installed, adjusted, and serviced by qualified technical personnel who are familiar with the construction, operation, and potential hazards of this type of machine.

All wiring, disconnects, and fuses should be installed by qualified electrical technicians in accordance with electrical codes in your region. Always maintain a safe ground. Do not operate the equipment at power levels other than what is specified on the machine serial tag and data plate.

(continued)

Warnings and Cautions (continued)

⚠ DANGER: Pinch Hazard

Never remove or disable safety devices to sustain production. Operating without these devices could lead to hazardous conditions that can cause severe injury. Take all necessary precautions when working around moving parts to prevent body parts and clothing from being pulled into the machine.

⚠ WARNING: Voltage hazard

This equipment is powered by alternating current, as specified on the machine serial tag and data plate. Do not operate the equipment at power levels other than what is specified on the machine serial tag and data plate.

A properly sized conductive ground wire from the incoming power supply must be connected to the chassis ground terminal inside the electrical enclosure. Improper grounding can result in severe personal injury and erratic machine operation.

Before performing maintenance or repairs on this product, disconnect and lock out electrical power sources to prevent injury from unexpected energization or start-up. A lockable device has been provided to isolate this product from potentially hazardous electricity.

⚠ DANGER: Sharp Blades!

Most injuries caused by knife blades occur when the cutter has been turned off. Handle blades with care at all times.

- Always wear cut-resistant gloves when the cutting chamber is open and when handling blades.
- Always lock out power to the cutter before opening the cutting chamber.
- Always wait until the cutter head has completely stopped before opening the knife guard.

CSC cutters are equipped with several safety devices to ensure safe operation. Never remove or disable these devices to sustain production. Operating without these devices can cause severe injury.

- When the knife guard is opened, the knife guard switch stops the cutter.
- Two proximity-type safety switches prevent operation unless the cutter bushings are in place.
- The Cutter Stop button activates a circuit that stops the knife.

Preventative Maintenance Schedule

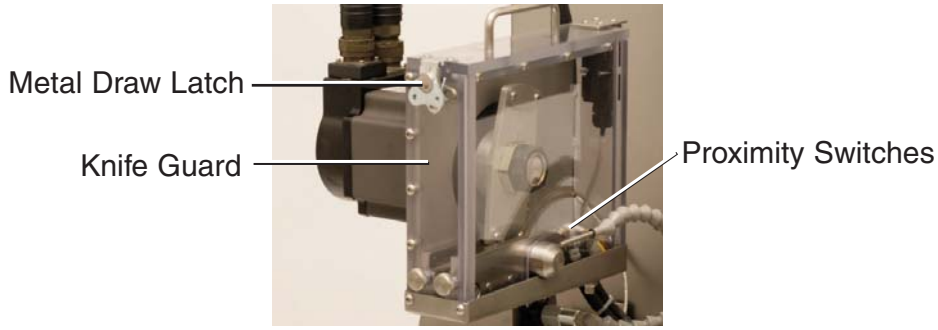
- **Daily**
  - ❒ **Checking puller belts for wear**
    If a belt shows sign of cracks, tears, or other damage, replace it. *See Maintenance Section entitled, Replacing Belts*
  - ❒ **Checking puller belt tension**
    Check the belt tension. *See Maintenance Section entitled, Testing Belt Tension.*
  - ❒ **Checking belt gap**
    Check the belt gap. *See Maintenance Section entitled, Checking the Belt Gap.*
  - ❒ **Inspecting cutter blade(s)**
    Clean, sharpen or replace as needed. *See Maintenance Section entitled, Inspecting the Cutter Blades.*
  - ❒ **Inspecting the blade mounting hardware**
    Check the blade-securing bolt and the holding pins. *See Maintenance Section entitled, Inspecting Blade Hardware.*
  - ❒ **Inspecting cutter bushing screws**
    Check that the cutter bushing screws are secure. *See Maintenance Section entitled, Inspecting the Cutter Bushing Screws.*
  - ❒ **Checking the closure latch on the knife guard**
    See *Maintenance Section entitled, Checking the Closure Latch.*
  - ❒ **Inspecting unit alignment**
    Proper alignment with other equipment on the line is critical for optimum performance. Use a plumb line or laser to check for a straight line from the extrusion die to the cutter bushings.
  - ❒ **Checking floor locks**
    See Maintenance Section entitled, Checking Floor Locks.

- **Weekly**
  - ❒ **Cleaning the blade tray** *See Maintenance Section entitled, Cleaning the Lubrication Tray.*
  - ❒ **Lubricating shafts on slide rail system**
    See Maintenance Section entitled, Lubricating the Linear Rail.
  - ❒ **Checking shafts and grease fittings**
    Lubricate all shafts and grease fittings as needed. *See Maintenance Section entitled, Checking the Grease Locations.*

(continued)

Preventative Maintenance Schedule (continued)

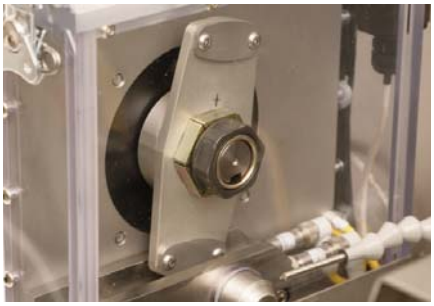
- **Monthly**
  - ❒ **Checking hardware on the knife guard**
    Inspect the hardware on the knife guard (fasteners on hinge and the clear blade guard window). Tighten as needed.
  - ❒ **Checking bushing holder proximity switches**
    Inspect the proximity switch set screws. Adjust as needed. *See Maintenance Section entitled, Adjusting the Cutter Proximity Switches.*
  - ❒ **Cleaning the clear blade guard window**
    Clean using glass cleaner or plain water. Other materials may cause premature loss of clarity or crazing.
  - ❒ **Checking the metal draw latch**
    Inspect the latch on knife guard for wear and proper tension. Readjust or replace as needed.



- **Semi-annual (every six months)**
  - ❒ **Inspecting electrical terminals**
    Check all electrical terminals for tightness; adjust as needed. *See Maintenance Section entitled, Checking Electrical Connections.*
  - ❒ **Checking torque on Trantorque coupling device**
    Check the tightness (torque) of the Trantorque coupling device with a torque gauge. This device connects the cutter head to the Micron reducer shaft. *See Maintenance Section entitled, Checking Torque.*
  - ❒ **Checking all electrical cables**
    Inspect all electrical cables for cuts and abrasions. Replace as needed. *See Maintenance Section entitled, Checking Electrical Connections.*
  - ❒ **Inspecting control panel lights**
    Check to make sure no LEDs or lights are burned out on the control panel. Replace as needed.

Inspecting Cutter Blades

Blades become dull over time depending on the material being cut, cut rate, blade speed, and blade material and thickness. Check blades regularly for sharpness as well as scratches, nicks, burrs, and material buildup. Clean, or replace as needed. *See Installation Section entitled, Installing Cutter Blades.*



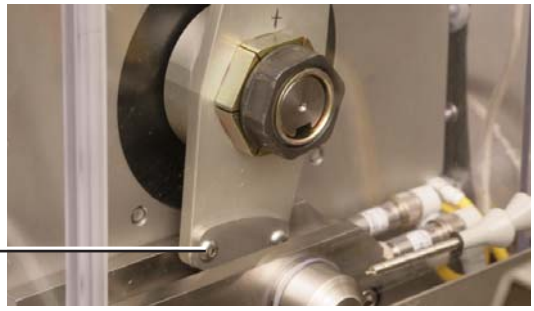
⚠ **DANGER: Sharp Blades!**

Most injuries caused by knife blades occur when the cutter has been turned off. Handle blades with care at all times.

- Always wear cut-resistant gloves when the cutting chamber is open and when handling blades.
- Always lock out power to the cutter before opening the cutting chamber.
- Always wait until the cutter head has completely stopped before opening the knife guard.

Inspecting Blade Hardware

The blade-securing bolts should use both a lock washer and flat washer, and be tightened enough to fully compress the lock washer.

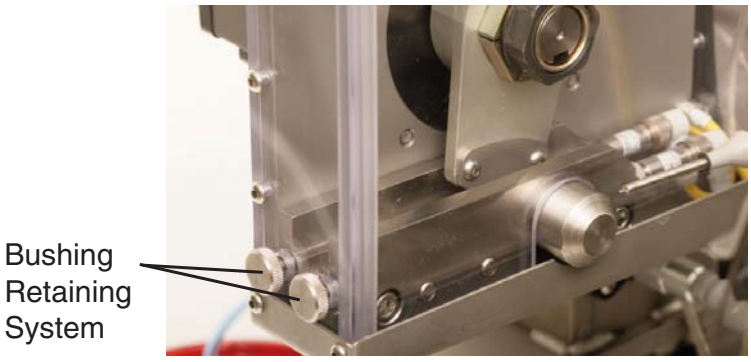


⚠ **WARNING:**

Do not operate the combination puller/cutter without washers and blade-securing bolt securely in place.

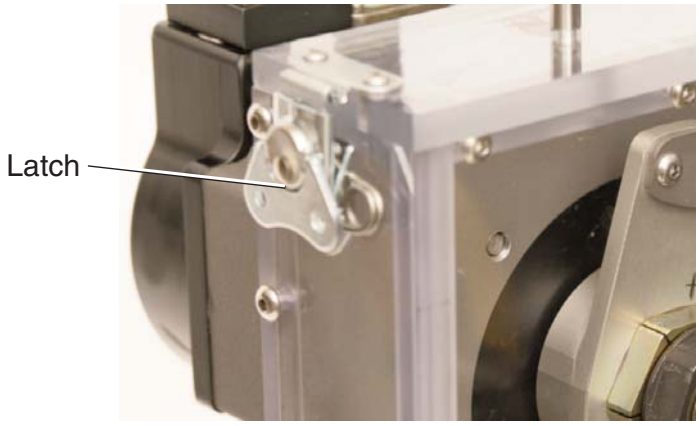
Inspecting Bushing Retaining System

Check the bush retaining system that secures the cutter bushings. If bushings move during cutting, cutting blades, and possibly the drive chain, could be damaged.



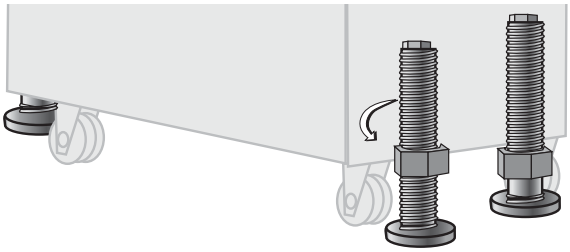
Checking the Closure Latch

Check the latch and adjust it so the knife guard closes completely. This prevents false triggering of the safety switch.



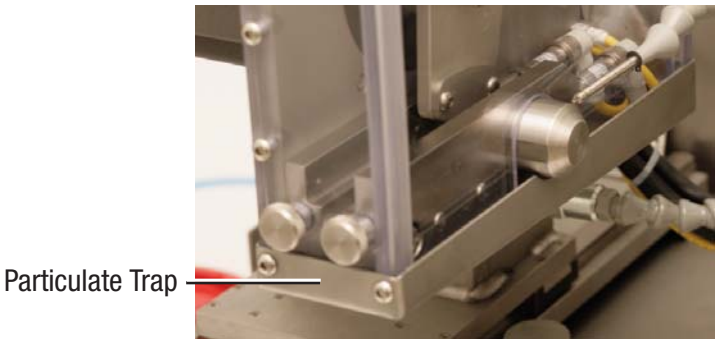
Checking Floor Locks

It is best to remove the weight from the casters for optimum stability during cutting cycles. Check to see if the floor locking mechanism is properly adjusted.



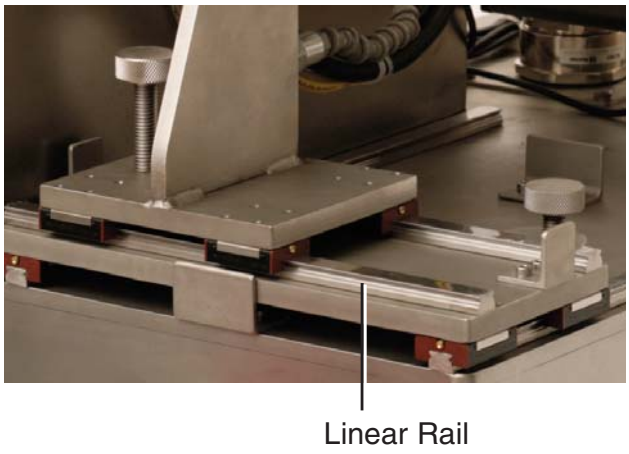
Cleaning Particulate Trap

The Particulate Trap is built into the cutter assembly. Depending on cut rate and type of material and lubrication, the area will need to be cleaned on a regular basis. Open the knife guard and, using a shop vac or other similar equipment, remove all liquid and solids from the cutting chamber and around the bushings.



Lubricating the Linear Rail

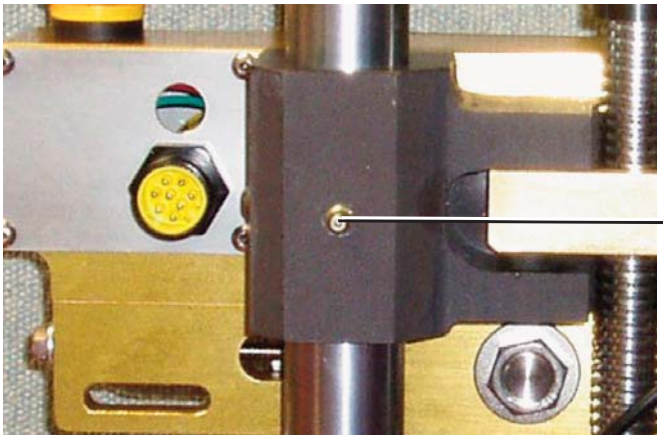
Check the shafts on the linear rail system. Even though these rails are stainless steel, it is recommended that a light oil (WD-40 or similar) be applied to the shafts as needed. Wipe off any excess.



Checking Grease Locations

For Puller Model 1-12

Lubricate all shafts and grease fittings as needed.



NOTE: Use regular grease for all locations except thread rods, vertical shafts, and vertical shaft drive boxes.
For thread rods use FDA silicone or grease.

Lubricating Shaft and Fittings

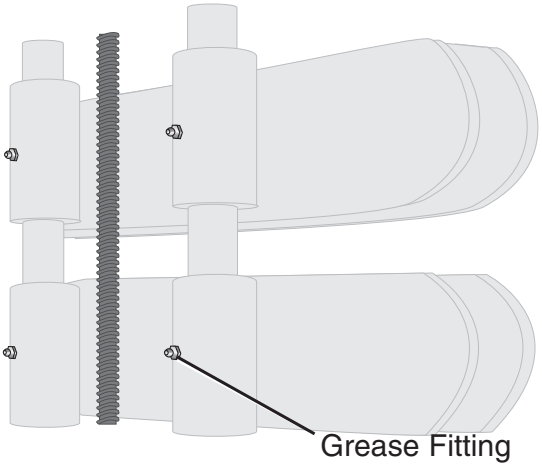
For Puller Model 3-20

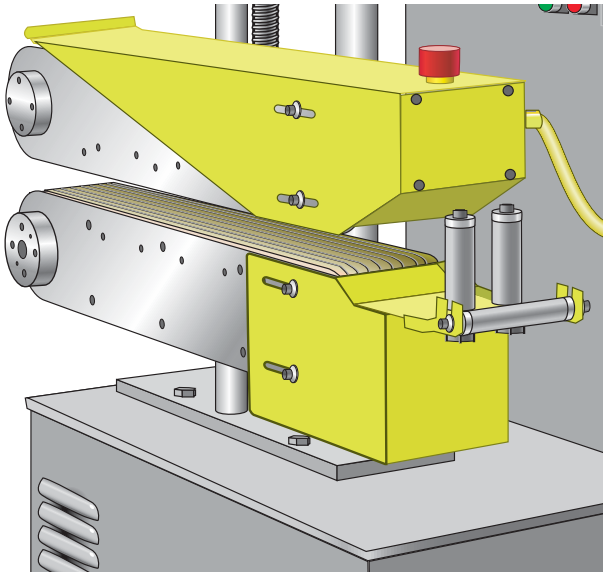
You should check the shafts and grease fittings weekly, and lubricate as needed

Lubricate thread rods and vertical shafts with Never-Seize or an equivalent lubricant.

Lubricate the vertical shaft drive boxes with a high-temperature grease, such as Mobil grease 28 or an equivalent.

You can use regular grease on all other locations.



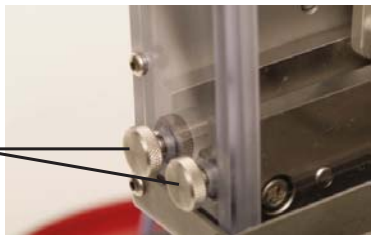


Adjusting the Cutter Proximity Switches

Follow all warnings and cautions listed at the beginning of the Maintenance section of this User Guide.

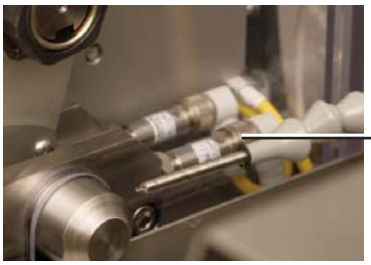
1 **Be sure the main power is disconnected** and the cutter is locked out.

2 **Loosen the bushing retaining system** that holds the cutter bushings.



3 **Remove the cutter bushings.**

4 **Check the depth of the proximity switch** face for each bushing. It should be recessed no more than 0.010 inches, but should not interfere with the bushings themselves.



5 **Use a wrench to check the tightness** of each proximity switch

✎ **NOTE:** You can damage the proximity switch if you over-tighten

6 **Replace cutter bushings** and check for proper cutting blade alignment. *See Installation Section entitled, Mounting the Cutter Bushings and Appendix C and D.*

7 **Plug in the power cord** and turn the main power disconnect to the "ON" position if all other maintenance is completed.

Checking Electrical Connections

⚠ **WARNING: Electrical Hazard**

Before performing any work on this product, disconnect and lock out electrical power sources to prevent injury from unexpected energization or start-up. A lockable device has been provided to isolate this product from potentially hazardous electricity.

⚠ **WARNING: Improper Installation, operation, or servicing may result in equipment damage or personal injury.**

This equipment should only be installed, adjusted, and serviced by qualified technical personnel who are familiar with the construction, operation, and potential hazards of this type of machine.

All wiring, disconnects, and fuses should be installed by qualified electrical technicians in accordance with electrical codes in your region. Always maintain a safe ground. Do not operate the equipment at power levels other than what is specified on the machine serial tag and data plate.

1 **Be sure the main power is disconnected and the cutter is locked out**. Always disconnect and lock out the main power source before opening the unit or servicing.

2 **Turn the main power disconnect to the off position** before opening the electrical enclosure on the back of the cutter, or the back of the control. This is a safety device to prevent you from opening the doors if the power is still on.

(continued)

Checking Electrical Connections
(continued)

3 **Open the electrical enclosure.**

4 **Inspect all wires and connections**. Look for loose wires, burned contacts, and signs of over-heated wires. Have a qualified electrician make any necessary repairs or replacements.

5 **Close the electrical enclosure door.**

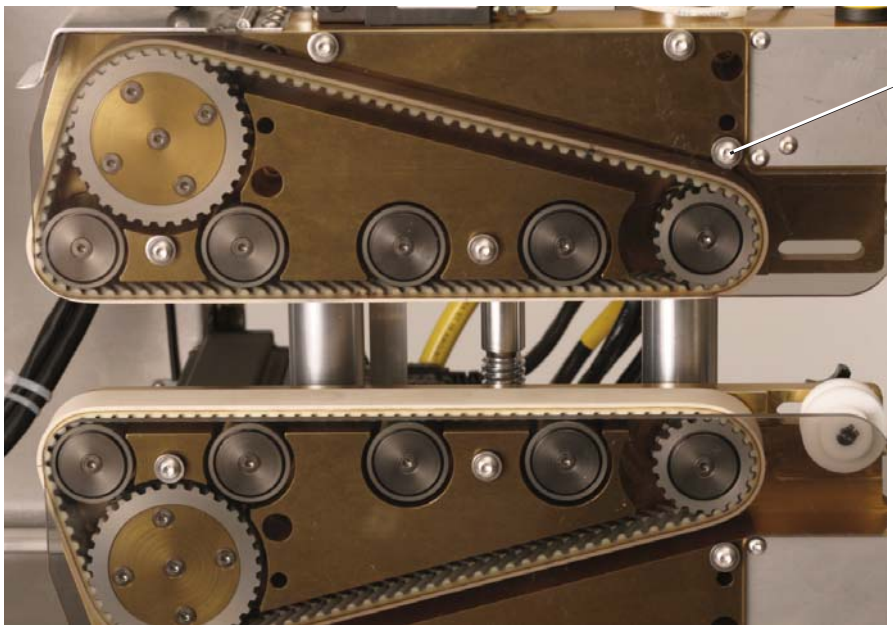
6 **Inspect the exterior power cords.** Cords should not be crimped, exposed, or rubbing against the frame. If the main power cord runs along the floor, make sure it is not positioned where it could rest in pooling water or could be run over and cut by wheels or casters.

Testing Belt Tension

1 Turn the main power disconnect to the off position.

2 Remove the upper and lower belt guards:

- **Remove the five (5) screws** that attach the guard at the front.
- **Disconnect the safety cable** (upper guard).
- **Lift off and remove guard.**



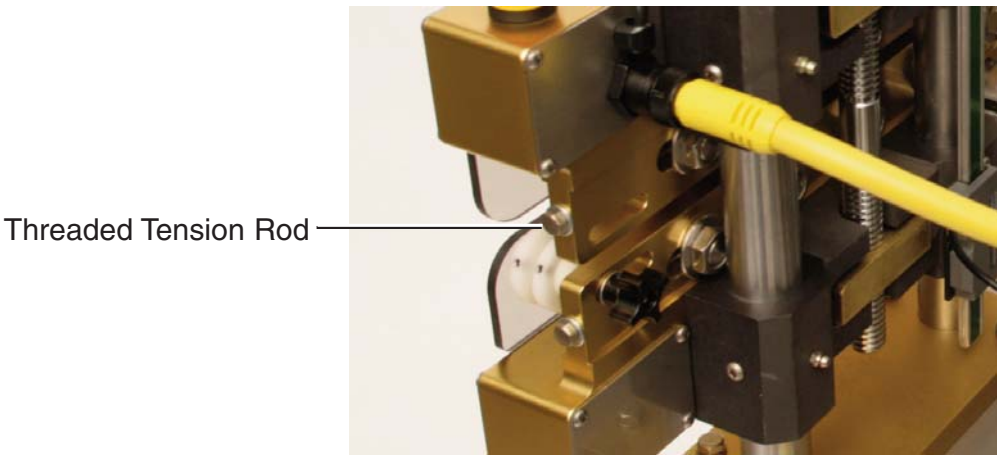
3 Check belt tension. Use a tension-measuring tool. Belts should be just tight enough, and the gap between the upper and lower belts should be even across the width of the belt.

✎ **NOTE:** It is important to have the proper belt tension. Loose belts result in belt and product slippage; over-tightened belts result in distorted product and can lead to premature bearing failure.

(continued)

Testing Belt Tension (continued)

4 Adjust belt tension, if necessary.
Adjust tension by turning the threaded tension rod.



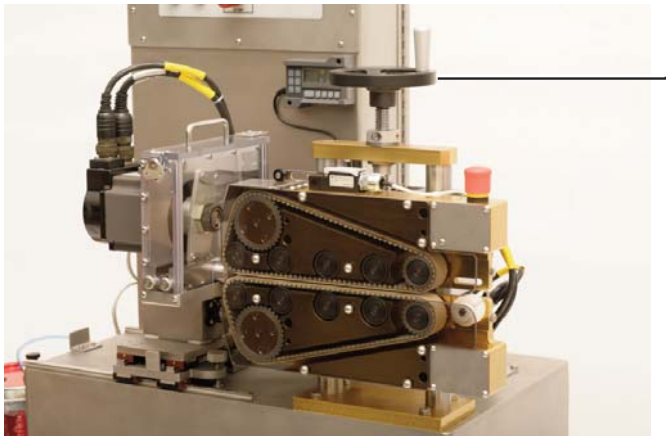
5 Fine tune tension:

- **Lower the belts** to a gap of about 1/8" (3 mm). *See Installation Section entitled, Adjusting Belt Gap.*
- **From the upstream end of the belts**, look down the length of the belts at the gap between the belts. If the gap is not even, adjust the tension until the gap is even and measures 1/8". The shape of the gap should not be concave (over-tightened) or convex (too loose).
- **Check tension and readjust as necessary.**

Checking the Belt Gap

For Puller Model 1-12

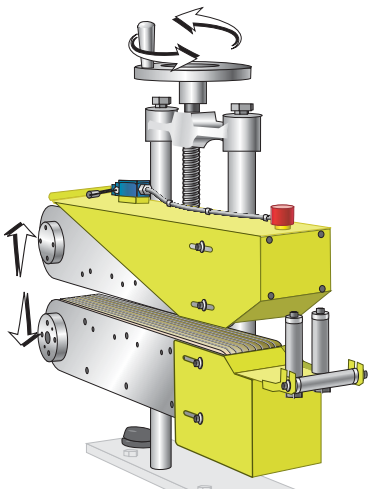
The upper and lower belt boom assemblies are controlled by a common threaded rod. Turn the hand wheel to move the belts up and down.



For Puller Model 3-20

The belt gap should be set to the dimensions of the extruded product, being careful not to make the gap so small that the pressure causes distortion in the product.

The upper and lower belt boom assemblies are controlled by a common threaded rod. The upper and lower belts move away from each other or toward each other as the hand wheel is turned.



1 **Turn the hand wheel** until the gap between the belts reaches the desired distance.

Replacing the Belts

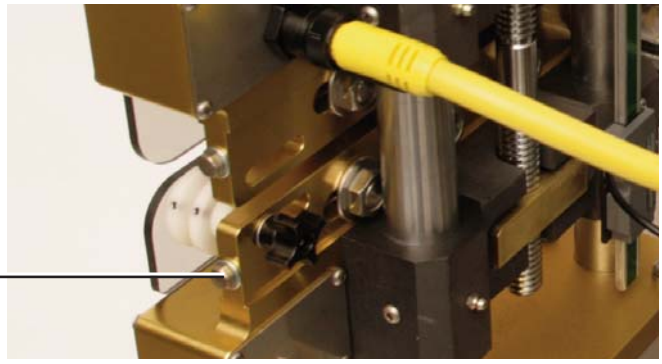
For Puller Model 1-12

To replace puller belts:

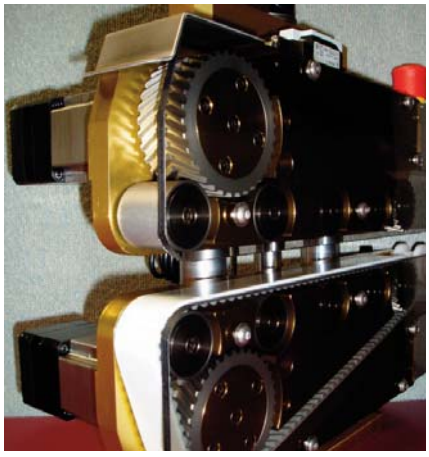
1 **Turn the rotary disconnect to the OFF position.**

2 **Remove the upper and lower belt guards.**

3 **Release belt tension** by loosening the threaded rods. Keep tension on front and back edges as even as possible by turning each rod 5-10 revolutions, then switching to the other side. Continue until the belt is loose enough to slide off the puller.



4 **Remove the belt from the puller.** Check the rollers and pulleys for buildup, especially inside grooves. Clean if necessary.



5 **Reverse the process to install the new belt.**

Make sure ribs inside the belt fit properly into grooves, and keep tension on front and back sides as even as possible by alternating between the two threaded rods.

6 **Adjust belt tension and belt gap.** *See Maintenance Section entitled, Testing Belt Tension.*

Replacing the Belts (continued)

For Puller Model 3-20

WARNING: Moving Parts
Improper servicing may result in equipment damage or personal injury.

Before removing lockout devices and returning switches to the ON position, make sure that all personnel are clear of the machine, tools have been removed and all safety guards are reinstalled.

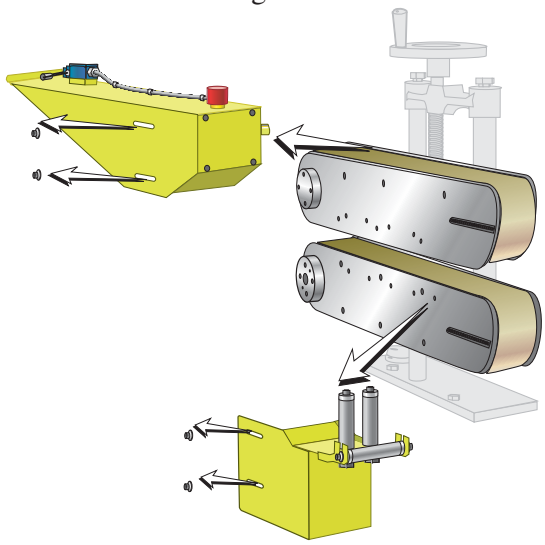
This equipment should be adjusted and serviced by qualified technical personnel who are familiar with the construction, operation, and potential hazards of this type of machine.

Before performing maintenance or repairs on this product, disconnect and lock out electrical power sources to prevent injury from unexpected energization or start-up. A lockable device has been provided to isolate this product from potentially hazardous electricity.

Make sure all safety devices and belt guards are installed before resuming normal operation.

1 **Turn the main power disconnect to the off position.**

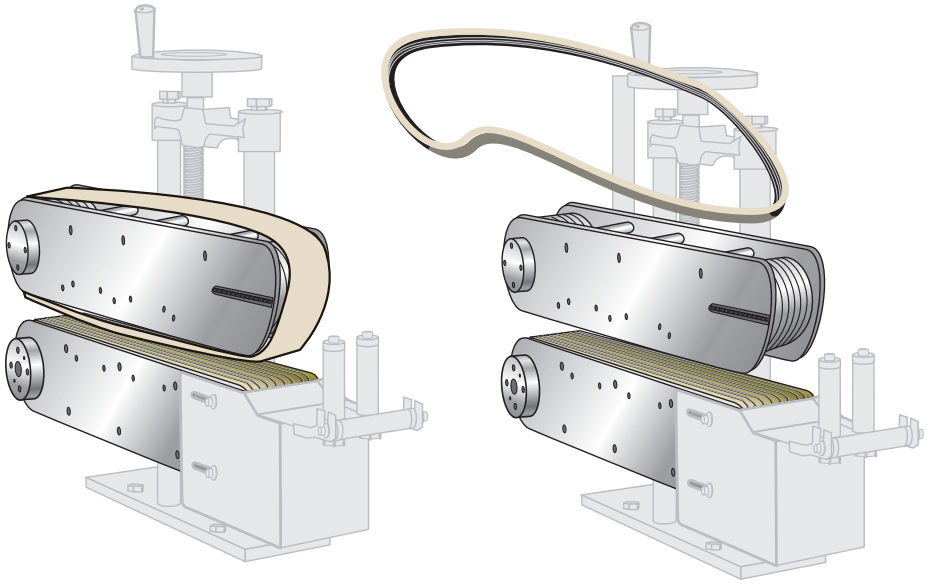
2 **Remove the belt guards.** Remove the screws attaching guards to unit (four on each guard: top, bottom, front and rear). Disconnect the safety cable on the upper guard. Lift off and remove guard.



3 **Release the belt tension.** Loosen the threaded rods, making sure you keep tension on front and back edges as even as possible. Turn each rod 5 to 10 revolutions, then switch to the other side. Continue until the belt is loose enough to slide off the puller.

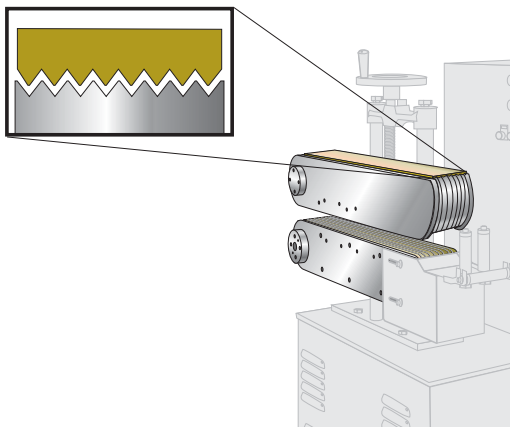
Replacing the Belts

For Puller Model 3-20 (continued)



4 **Remove the belt from the puller.** Check the rollers and pulleys for buildup, especially inside grooves. Clean if necessary.

5 **Reverse the process to install the new belt.** Make sure ribs inside the belt fit properly into grooves. Keep tension on front and back sides of the belt as even as possible while tightening the belt tension. Turn each rod 5 to 10 revolutions, then switch to the other side.



6 **Adjust belt tension and belt gap.** *See Installation Section, entitled Adjusting the Belt Tension and Setting the Belt Gap.*

7 **Reinstall the upper and lower belt guards.**

Checking Torque

⚠ **WARNING: No Lubricants!**
Do NOT use lubricants on the Trantorque coupling device.

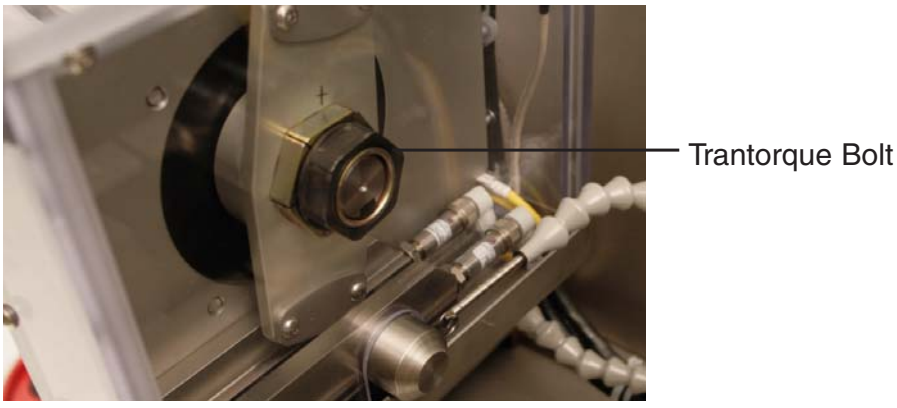
⚠ **WARNING: Sharp Blades!**
Always wear cut-resistant gloves when the cutting chamber is open and when handling blades. Never open cutting chamber without locking out the cutter power and waiting until the cutter head has stopped completely. Handle blades with care at all times..

The Trantorque coupling device connects the servo motor to the cutter head. It is important that it is tightened to the proper torque.

1 **Carefully remove the cutter blade.**

2 **Check to make sure both the shaft and component bore** of the Trantorque coupling device are completely free of paint, grease, oil, and dirt. If necessary, clean the surfaces with a non-petroleum based solvent, such as isopropyl alcohol.

3 **Use a torque wrench** to make sure the nut is tightened to the proper installation torque (2000 in-lb or 225 N-m). Do not overtighten; it can cause damage to the unit.



SECTION
6

Troubleshooting

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Before Beginning

You can avoid most problems by following the recommended installation, operation and maintenance procedures outlined in this User Guide. If you have a problem, this section will help you determine the cause and tell you how to fix it.

Before you begin troubleshooting:

- ❏ Find any wiring, parts, and assembly diagrams that were shipped with your equipment. These are the best reference for correcting a problem. The diagrams will note any custom features or options not covered in this User Guide.

- ❏ Verify that you have all instructional materials related to the puller. Additional details about troubleshooting and repairing specific components are found in these materials.

- ❏ Check that you have manual for other equipment connected in the system. Troubleshooting may require investigating other equipment attached to, or connected with the puller.

A Few Words of Caution

⚠ **WARNING: Improper installation, operation or servicing may result in equipment damage or personal injury.**

This equipment should only be installed, adjusted, and serviced by qualified technical personnel who are familiar with the construction, operation, and potential hazards of this type of machine.
All wiring, disconnects, and fuses should be installed and adjusted by qualified electrical technicians in accordance with electrical codes in your region. Always maintain a safe ground. Do not operate the equipment at power levels other than what is specified on the machine serial tag and data plate.

⚠ **WARNING: Electrical hazard**

Before performing maintenance or repairs on this product, disconnect and lock out electrical power sources to prevent injury from unexpected energization or start-up. A lockable device has been provided to isolate this product from potentially hazardous electricity.

(continued)

A Few Words of Caution (continued)

⚠ **DANGER: Sharp Blades!**

Most injuries caused by knife blades occur when the cutter has been turned off. Handle blades with care at all times.

- Always wear cut-resistant gloves when the cutting chamber is open and when handling blades.
- Always lock out power to the cutter before opening the cutting chamber.
- Always wait until the cutter head has stopped completely before opening the knife guard.

Combination puller/cutters are equipped with several safety devices to ensure safe operation. Never remove or disable these devices to sustain production. Operating without these devices can cause severe injury.

- When the knife guard is opened, the knife guard switch stops the cutter.
- Two proximity-type safety switches prevent operation unless the cutter bushings are in place.
- The Cutter Stop button activates a circuit that stops the knife.

Identifying the Cause of a Problem

The *Troubleshooting section* covers problems directly related to the operation and maintenance of the Combination Puller/Cutter. This section does not provide solutions to problems that originate with other equipment. Additional troubleshooting help can be found in manuals supplied with the other equipment.

The main problems you will see with the Combination Puller/Cutters are:

- **Puller operation problems**, which focus on problems that are clearly related to the pullers mechanical components and electrical control system.

- **Cutter operation problems**, which focus on problems that are clearly related to the operation of the cutter's mechanical components and electrical control system.

- **Product quality concerns**. Extrudate quality problems may be related to Combination Puller/Cutter operation. Of course, other sections of the extrusion line also influence the quality of the extruded product. This section does not provide solutions to problems originating with other equipment on the extrusion line.

Additional troubleshooting help can be found in the documentation manuals included with this User Guide.

Puller Operation Problems

Symptom	Possible cause	Solution
The puller 'creaks' while running.	The belt is too tight.	Check the belt tension; loosen if necessary.
	The bearings are failing.	Replace the bearings.
The puller does not start.	The "Emergency Stop" button is pushed in.	Pull out the "Emergency Stop" button. (Make sure it clicks into position.)

Cutter Operational Problems

Symptom	Possible Cause	Solution
Servo drive is without power.	The “Emergency Stop” button is pushed in.	Pull out the “Emergency Stop” button.
	Master safety relay not energized	Check that the bushings are in place.
		Make sure that the blade guard is closed.
		Master Safety relay (ISC) has failed. Replace relay.
	A safety switch has failed.	Check connections and replace if needed.
Pressing Start Cutter has no effect. The light does not light.	There is a loose connection.	Check wiring between push button and the relay. (ICR)
	The relay is bad. (ICR)	Replace the relay.
	The safety circuit failed.	Check safety circuit, repair or replace components.
Pressing the Manual cut button does not produce a cut when in an on-demand mode.	The servo amplifier motion program not running.	Stop then restart the cutter, if necessary, reboot main power.
	There is a loose connection.	Check wiring between the push button and input three on the servo drive and tighten connection.

Cutter Operational Problems (continued)

Symptom	Possible Cause	Solution
After pressing Start Cutter, the cutter head rotates and stops in wrong position.	The Blade Home proximity switch failed or the connection to it is loose.	Check connections and replace switch if needed.
Master safety relay does not energize.	Guard circuit is open.	Check that the bushings are in place. Make sure that the blade guard is closed. Loose connection to guard circuit. Tighten connection. Guard switch is bad, replace switch. Bussing proximity is bad, replace switch.
	"Emergency Stop" button is pressed.	Pull out "Emergency Stop" button.
Measurement display does not change value.	Input from encoder failed.	Check encoder cable for continuity. Connect any loose wires.
	Encoder failed.	Replace encoder.

Cutter Operational Problems (continued)

Symptom	Possible Cause	Solution
In encoder or timer modes, the display shows the count which resets, but a cut does not occur at the point of reset.	There is a problem with the servo amplifier.	See Checking the Servo Amplifier.
	There is a loose connection.	Check wiring for loose connections.
Blade speed does not change when new speed is entered into the control.	There is a communication failure between the control and drive.	Check for wiring for loose connections and tighten.
Cutter mode selection does not change cut mode.	There is a communication failure between the control and drive.	Check for wiring for loose connections and tighten.
The park (home) position is drifting, i.e. the blade parks further away from the original park site.	The coupling between the servo motor and the Micron reducer has slipped.	*See Troubleshooting Section entitled, Checking the Motor Assembly.*
	The Trantorque coupling has slipped.	*See Maintenance Section entitled, Checking Torque.*

Cutter Operational Problems (continued)

Symptom	Possible Cause	Solution
Blade speed does not change when new speed is entered into the control.	There is a communication failure between the control and drive.	Check wiring for loose connections and tighten.
Cutter Mode selection does not change cut mode.	There is a communication failure between the control and drive.	Check wiring for loose connections and tighten.
The park (home) position is drifting, i.e. the blade parks further away from the original park position.	The coupling between the servo motor and the Micron reducer has slipped.	*See Troubleshooting Section entitled, Checking the Motor Assembly.*
	The Trantorque coupling has slipped.	*See Maintenance Section entitled, Checking Torque.*

Product Quality Problems

Symptom	Possible Cause	Solution
Annular rings present on the extrudate.	The belt puller is too close to the cutter.	If the extrudate is interrupted (stopped during processing), annular rings can develop, especially on a thin-walled product. Slightly increase the distance between the puller and the cutter, and test the product until the distance is correct.
Burrs at cut site.	The bushings do not provide enough support during cutting.	Change bushing design to make more supportive.
	The bushing gap is too wide.	Check that bushing gap is 0.001-0.003 in. larger than blade. Adjust if necessary.
	The blade speed is too low.	Increase blade speed or decrease the cut path area.
	The blade is too thick.	Use a thinner blade or add heat to extrudate.

Product Quality Problems (continued)

Symptom	Possible Cause	Solution
Hairs or strings.	Blade speed is too low.	Increase the blade speed or decrease the blade cut path area (blade width).
	The blade is too thick.	Excessive blade thickness can cause frictional heat. Use a thinner blade.
	The blade is wrong for the application.	Change angle of the blade attack or the blade style to decrease the cut path area.
	Material is building up on the blade and wiping off on the cut site.	Use blade lubrication (water, etc.) or change lubricants. *See Appendix D.* Consider a blade wiping system.
	There are imperfections on the blade.	The cutting edge should not have grind marks, burrs or other imperfections. Check the blade and replace if necessary.
	A hole or slot in the blade cut path is causing a 'cheese grater' effect.	Change to a different blade design. *See Appendix B.*
	The extrudate is too cold.	If the extrudate is too cold, it can fracture during cutting. Raise the extrudate's temperature.

Product Quality Problems (continued)

Symptom	Possible Cause	Solution
Cracks at cut site.	The extrudate is too cold.	If the extrudate is too cold, it can fracture or whiten during cutting. Raise the extrudate's temperature.
	The blade speed is too high.	High blade speeds can cause too much impact. Lower the blade speed.
	The bushings are not providing enough support during cutting.	Change the bushing design to make them more supportive.
	The cutting blade is too sharp.	A blade that is too sharp can fracture some materials, especially rigid PVC and nylons. Slightly dull the blade.
	If using Nylon, it may be cooling too quickly.	If nylon is cooled too quickly, its molecular structure may become unstable, leading to poor physical properties. Try more gradual cooling.

Product Quality Problems (continued)

Symptom	Possible Cause	Solution
Cut is not square.	The extrudate is too cold.	Low blade speeds can cause excessive blade interruption. Increase blade speed or decrease the blade cut path area.
	The blade speed is too high.	Check that blade is 90 degrees relative to the bushing holder.
	The bushings are not providing enough support during cutting.	If the cutter bushings are not properly gapped, the blade may be free to move with the extrudate. Check and adjust if necessary. *See Installation Section entitled, Mounting Cutter Bushings and Appendix C.*
	The cutting blade is too sharp.	If the knife bevel is asymmetric, the blade will tend to move in the direction of the smaller bevel. Be sure that the bevel is symmetric. **Note:** You can use this to your advantage with some rigid products.
	If using Nylon, it may be cooling too quickly.	There must be enough space between the puller and cutter to allow for the extrudate to stop during cutting.

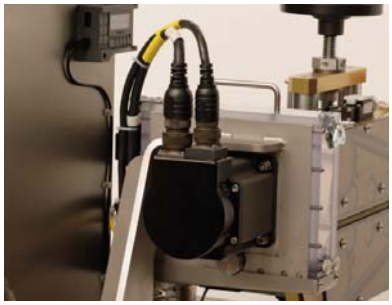
Product Quality Problems (continued)

Symptom	Possible Cause	Solution
Length of cut is incorrect.	Repeatability is wrong.	Test for repeatability. *See Troubleshooting Section entitled, Testing Repeatability. Also see Operation Section entitled, Tuning the Cutter if using Red Lion Servo controls for Repeatability Testing.*
	Encoder, input device problem.	Check encoder, input device and clean. Run repeatability test, *See Checking the Encoder, Troubleshooting Section.*
	There is a problem with the puller.	Run repeatability test. *See Troubleshooting Section entitled, Testing Repeatability. Also see Operation Section entitled, Tuning the Cutter if using Red Lion Servo controls for Repeatability Testing.*

Replacing Safety and Proximity Switches

Three safety switches are included in CSC cutter sections: a keyed safety switch on the knife guard, and a proximity switch on each cutter bushing. A failure in any of these switches prevents the puller/cutter from running.

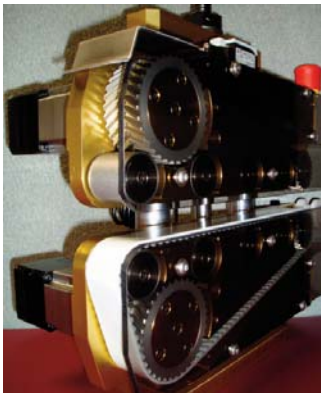
- **Safety Switch**
  If you suspect a problem with the keyed safety switch on the knife guard, check for loose or damaged wires. Replace the switch if wires appear to be undamaged.



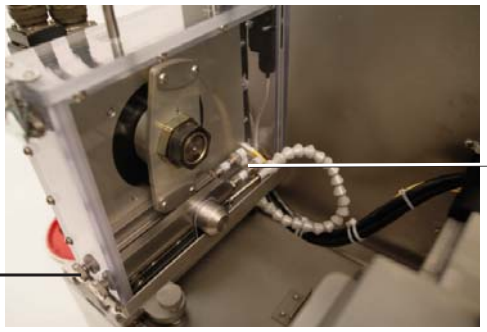
- **Proximity Switches**
  The proximity switches on the cutter bushings have LEDs that light when the bushing is sensed. If an LED does not light when both the bushing are in place:

1 **Check for loose or damaged wires.**

2 **Remove the cutter bushing** and make sure the proximity switch is properly positioned, i.e. 0.010" from the bushing surface.



3 **Remove the proximity switch** by loosening the bushing retaining system. Test it by bringing an object close to the sensor when the power is turned on. If the LED does not light, replace the proximity switch.



Checking the Servo Amplifier

The servo amplifier is equipped with a digital readout that can be seen through the viewing window on the electrical enclosure. This display shows amplifier status and error messages. Refer to the supplier's documentation included with this User Guide.

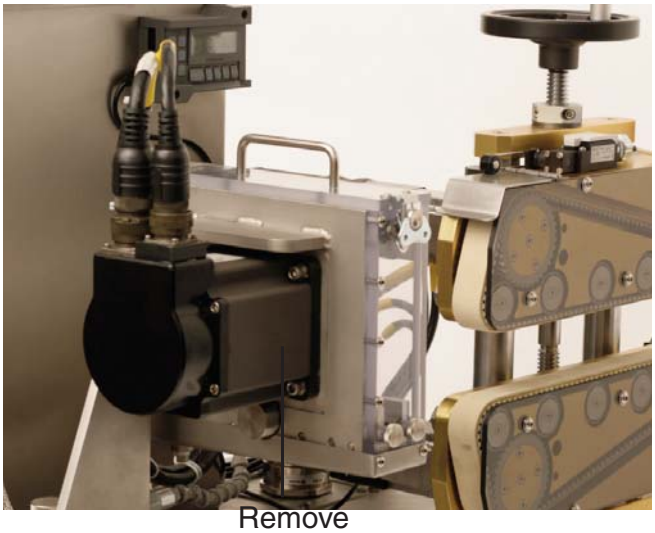
✎ **NOTE:** Make sure you look for servo amplifier messages before you shut off the power, because fault message will be lost.

Checking the Motor Assembly

1 **Open the knife guard.**

2 **Remove the cutter head** by loosening the Trantorque assembly. Refer to the manufacturer's guide included with this User Guide for information about the Trantorque assembly.

3 **Locate the four (4) bolts** holding the motor assembly to the cutter. Remove them and carefully remove the assembly from the cutter.



Checking the Encoder

When the encoder is working properly, the measurement displayed will count up to the preset and reset to zero.

1 **Check all connections.**

2 **Check the encoder cable for damage.** If necessary, replace.

3 **Check the connector that attaches the cable to the encoder.** Internal wiring may be shorted out if this connector is not handled properly.

4 **Check the encoder itself.** There should be no play in the shaft.

5 **If all else fails,** contact Conair Customer Service. *See Appendix A.*

⚠ **WARNING: Delicate equipment**

THe encoder is a delicate piece of equipment. Any rough handling can damage fragile parts.

✎ **NOTE:** *See Operation Section entitled, Set Up 2 Page Description, Tuning the Cutter if using Red Lion HMI and Control Techniques/Emerson Servo Drives*

Testing Repeatability

Before any Conair puller/cutters are shipped, they are tested for cut time repeatability to be sure they are within performance specifications. The repeatability test checks the performance of the rotary knife cutter to return the home park position after a complete cut. Acceptable repeatability times allowed for each cutter model prior to shipping are:

Type of Cutter	Repeatability Time
AC Pneumatic Cutter	Less than 1 millisecond
DC Pneumatic Cutter	Less than 1.5 millisecond
Velocity Servo (E Drive)	Less than 1 millisecond
Positional Servo (FX)	Less than 0.1 millisecond
CSC Positional Servo	Less than 0.1 millisecond

✎ **NOTE:** 1-millisecond at 60 feet per minute is equal to .012 inches.

The repeatability mode is built into the Conair cutter controls and allows you to perform similar tests, without any external test equipment. It is recommended that you check repeatability on a regular basis. Acceleration/deceleration delays of the servo do not contribute to repeatability error; any error is attributed solely to motor stability, couplings, assembly, power, and proximity sensor alignment.
Use any blade speed and line speed. The line speed is only seen while in the Encoder or Product modes. It is recommended that the tests be performed at cut intervals between 0.5 and 5-seconds. Do not change the blade speed or the line speed after starting the test.

To test repeatability:

1. **Turn on the cutter.** Perform the test in encoder mode with the cutter on-line. The Display will read: DevCP shows problems with the cutter. DevCC shows problems with the puller.
2. **Press the menu key to display operator functions.**
3. **Press soft key test to display DevCP screen.**
4. **Press soft key on/off to start the testing and display the results.**
5. **Press next key displays DevCC results.**

Repeat the test by pressing the Reset Cut button to begin a new sample period.

To end the Repeatability test, press soft key on/off or exit.

✎ **NOTE:** Previous key returns to DevCP screen.

Results of Repeatability Testing

NOTE: *See Operation Section entitled, Set Up 2 Page Description, Tuning the Cutter if using Red Lion HMI and Control Techniques/Emerson Servo Drives*

Results in Flywheel mode

The display shows DevCC a full revolution of the cutter head. The reading is in milliseconds, to the third decimal place, i.e. 0.010 is 0.01 milliseconds (or 10 microseconds). If the reading exceeds 0.200 there is a problem with the cutter drive. If this occurs the error is too large and there is a problem in the cutter drive that must be corrected.

Results in Timer mode

When testing repeatability in Timer mode, the cutter is making on-demand cuts at a set time interval (i.e. one-second intervals). The display shows the cut-to-part (CP) reading and the cut-to-cut (CC) reading. The reading is in milliseconds, to the third decimal place, i.e. 0.010 is 0.01 milliseconds (or 10 microseconds).

CP is the peak time variance between the cut signal output (preset time) to the servo amplifier, and the programmable limit switch just prior to the center of the bushing. This is the repeatability of the cutting system to accelerate through the part. This value is higher than the CC reading since it includes the acceleration and deceleration contributed by the servo motor.

CC is the peak time variance between cuts. Record and compare the cut-to-cut number to the CC value recorded in encoder or product mode shows how much error is by external influences (i.e. variation in belt puller speed, encoder mounting problem, etc.).

If the reading exceeds 0.200, there is a problem with the cutter drive. If this occurs the error is too large and there is a definite problem that must be corrected.

Results in Product mode

The display shows the cut-to-part (CP) reading and the cut-to-cut (CC) reading. The reading is in milliseconds, to the third decimal place, i.e. 0.010 is 0.01 milliseconds (or 10 microseconds).

Compare the cut-to-part (CP) reading to the CP reading in the other modes. There should be very little difference in these readings.

Compare the cut-to-cut (CC) reading to the CC reading in the other modes. Since the product mode is influenced by external signals, this reading will reflect the speed regulation of the puller.

Additional manuals and prints for your Conair equipment may be ordered through the Customer Service or Parts Department for a nominal fee.

We're Here to Help

Conair has made the largest investment in customer support in the plastics industry. Our service experts are available to help with any problem you might have installing and operating your equipment. Your Conair sales representative also can help analyze the nature of your problem, assuring that it did not result from misapplication or improper use.

How to Contact Customer Service

To contact Customer Service personnel, call:

You can commission Conair service personnel to provide on-site service by contacting the Customer Service Department. Standard rates include an on-site hourly rate, with a one-day minimum plus expenses.

Before You Call...

If you do have a problem, please complete the following checklist before calling Conair:

- ❒ Make sure you have all model, serial and parts list numbers for your particular equipment. Service personnel will need this information to assist you.
- ❒ Make sure power is supplied to the equipment.
- ❒ Make sure that all connectors and wires within and between control systems and related components have been installed correctly.
- ❒ Check the troubleshooting guide of this manual for a solution.
- ❒ Thoroughly examine the instruction manual(s) for associated equipment, especially controls. Each manual may have its own troubleshooting guide to help you.
- ❒ Check that the equipment has been operated as described in this manual.
- ❒ Check accompanying schematic drawings for information on special considerations.

Equipment Guarantee

Conair guarantees the machinery and equipment on this order, for a period as defined in the quotation from date of shipment, against defects in material and workmanship under the normal use and service for which it was recommended (except for parts that are typically replaced after normal usage, such as filters, liner plates, etc.). Conair's guarantee is limited to replacing, at our option, the part or parts determined by us to be defective after examination. The customer assumes the cost of transportation of the part or parts to and from the factory.

Performance Warranty

Conair warrants that this equipment will perform at or above the ratings stated in specific quotations covering the equipment or as detailed in engineering specifications, provided the equipment is applied, installed, operated and maintained in the recommended manner as outlined in our quotation or specifications.

Should performance not meet warranted levels, Conair at its discretion will exercise one of the following options:

- Inspect the equipment and perform alterations or adjustments to satisfy performance claims. (Charges for such inspections and corrections will be waived unless failure to meet warranty is due to misapplication, improper installation, poor maintenance practices or improper operation.)
- Replace the original equipment with other Conair equipment that will meet original performance claims at no extra cost to the customer.
- Refund the invoiced cost to the customer. Credit is subject to prior notice by the customer at which time a Return Goods Authorization Number (RGA) will be issued by Conair's Service Department. Returned equipment must be well crated and in proper operating condition, including all parts. Returns must be prepaid.

Purchaser must notify Conair in writing of any claim and provide a customer receipt and other evidence that a claim is being made.

Warranty Limitations

Except for the Equipment Guarantee and Performance Warranty stated above, Conair disclaims all other warranties with respect to the equipment, express or implied, arising by operation of law, course of dealing, usage of trade or otherwise, including but not limited to the implied warranties of merchantability and fitness for a particular purpose.

Cutter Blade Selection and Use

Cutter blade characteristics such as material, design, and thickness can have a large effect on cut quality.

Blade materials

- **Blue tempered spring steel** is most commonly used because of its cost and availability over a wide range of thicknesses (0.010-0.062 inch). It is a very tough material with an HRC value of approximately 48-51 and fair wear characteristics.

- **Razor blade stainless steel** is becoming very popular due to its HRC value of 57-58, which leads to improved wear resistance. This material retains good toughness, but will chip or break. It is available in 0.010-0.062 inch thicknesses. Because it is non-corrosive, stainless steel is a good choice for medical cutting applications, and may even be coated with Teflon to enhance cut quality.

- **A-2** is a good grade of tool steel with an HRC of 60. Its minimum thickness (0.031 inch) forces the blade manufacturer to grind it down for thinner applications, which adds cost. A-2 is more wear resistant than stainless, but is also more brittle.

- **M-2** is an excellent grade of tool steel with an HRC of 63-66. It is one of the best materials for coating with titanium nitride for improved wear resistance. (However, coatings generally cause some slight loss of sharpness.) 0.025 inch material is available, which covers many applications without the need for secondary grinding operations.

- **D-2** is another excellent tool steel with an HRC range of 58-60. It is tougher than M-2 but has slightly less wear resistance. Its minimum thickness (0.035 inch) and the need for specialized grinding materials, make it a relatively expensive material. It is the material of choice for cutting Kevlar-reinforced hose.

- **CPM 10-V** is a form of carbide developed especially for the high speed punch industry. With an HRC of 60-62 and a toughness that far exceeds D-2, it is by far the best cutting blade material. Because its minimum thickness is 0.035 inch, and it requires the use of diamond grinding wheels, CPM 10-V is the most expensive of the blade materials.

Cutter Blade Selection and Use (continued)

Blade Design

- **Straight-edge knives** have a straight cutting surface. A chopping action (which has cutting forces parallel to the cut) is typically obtained with straight-edge blades.

  Because the blade is mounted on a rotary arm, some slicing action (which has additional force vectors at various angles to the cutting edge) is obtained, but generally not through the entire cutting action. If a slicing action is required, the angle of attack can be modified by mounting the blade on a 30-45 degree angle as close to the cut site as possible. In many cases the bushings must be modified to allow the blade holder to have close proximity to the cut site. This offers the steepest angle of attack throughout the entire cutting process. Generally straight knives can be obtained in thicknesses from 0.004-0.060 inch depending on the application.

- **Curved-edge knives** offer increased slicing throughout the entire cutting action. They are generally used for cutting rubber preforms, rubber hose, flexible foams, and other materials that require slicing. Blade lubrication is often used to enhance the cut and minimize blade and bushing buildup.

  As a general rule, curved-edge knives offer improved cut quality on rigid materials if additional heat can be used. However if used on cold rigid materials, curved knives have a tendency to produce wavy or angled cuts.

  A curved edge knife can sometimes cut larger cross section profiles and tubing with the same horsepower as a straight edge blade. However, the use of a curved blade increases product interruption. To overcome this effect, use a variable speed rotary knife cutter to vary the blade speed to obtain the desired cut quality.

- **Piercing blade (bat-wing, woodpecker) knives** are specifically designed for cutting thin wall tubing. Their shape minimizes penetration marks caused by the flattening action of the blade prior to penetration of the extrudate. These are the most expensive type of blade, and the most susceptible to breakage. Because the point is exposed and not fully supported by the bushings, it may deflect into the bottom of the bushing bore and break off. For these reasons, piercing blade knives are usually used as a last resort.

Some rigid materials require warming when this type of blade is used because the impact of the point can cause cracking or whitening.

Cutter Blade Selection and Use (continued)

Blade Thickness

Because material is displaced rather than removed in rotary knife cutting, think of the blade as a wedge. The thicker the blade, the greater the displacement. This displacement can cause fracture in rigid profiles and tubing, which is often observed as a whitening on all or a portion of the cut. You can reduce this fracturing by reducing the thickness of the blade.
(This effect can also be minimized by heating the profile or tube. However, if heat is used to enhance cut quality, the bushings must be supportive enough to minimize distortion.)

If the cutting blade is too thin, it may actually deflect within the bushing bore. This can lead to "S" shaped cuts or premature blade breakage.

Optimizing Blade Speed

Flexible extrudates generally require a very fast blade speed with a slicing action for best results. This is due to the fact that even minimal interruption can cause a blade jam on a product that has little or no internal strength.

On the other hand, rigid extrudates may require different blade speeds to obtain the desired cut quality. What's needed for a particular application depends on blade style, internal heat, and blade thickness. Speeds as slow as 300 rpm may be required if a curved blade is used with little or no heat.

Improving Cut Quality by Adding Heat to Certain Materials

All rigid extrudates can have their cut quality improved by the addition of heat. A few of the most common materials and the respective temperatures are listed below:

Rigid PVC	110°-125° F
Styrene ABS	120°-135° F
Polypropylene	160°-200° F

It is important to remember that as the temperature approaches the glassification zone, the degree of support offered by the bushing becomes more important.

Calculating Blade Interruption

Blade interruption is the length of time which the blade interrupts the extrudate during the cutting process. Knowing blade interruption allows you to optimize blade speed and design for specific applications.

You can calculate blade interruption for your application if you know:

- the cutting blade width
- blade speed (cutter rpm)
- extrudate cross section.

The rotary knife cut path circumference is fixed for each cutter model:

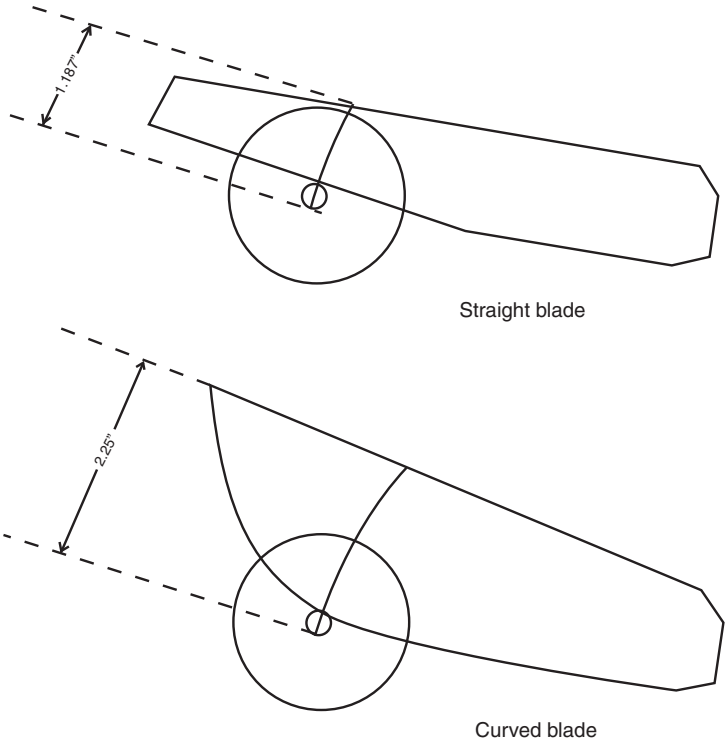
CSC Model	Bushing Diameter	Knife Cut Path Diameter	Knife Cut Path Circumference
1L	1.25"	10"	31.4"

As an example, calculate the blade interruption (in milliseconds) for an CSC1 cutter running 1/4" (0.250") OD tubing. The blade speed is 718 rpm and the cutting blade is 15/16" (0.937") width at the point where it passes through the extrudate, and the cut path circumference is 31.4" for the CSC1.

Calculate the blade interruption time. The interruption time starts when the blade makes its first contact with the extrudate and ends when the blade is totally clear of the product (i.e. no longer interrupting it). Because we know the blade travel speed, we can calculate the interruption time if we know how far the blade travels during period of interruption. This distance is equal to the sum of the extrudate outer diameter and the blade width at the point of contact.

$$\text{Blade interruption time, msec} = \frac{(\text{Product OD} + \text{Blade width})}{\text{Knife circumference}} \times \frac{60{,}000}{\text{rpm}}$$

Calculating Blade Interruption (continued)



To calculate interruption time:

$$\frac{(0.937 \text{ in.} + 0.250 \text{ in.})}{31.4 \text{ in.}} \times \frac{60{,}000 \text{msec/rev}}{718 \text{ rpm}} = 3.2 \text{ msec}$$

Knowing the interruption time and the line speed, you can calculate the amount of production deflection that must be accommodated during cutting. To calculate the amount of extrudate deflection between the cutter and puller, multiply line speed by interruption time:

Blade Interruption time, msec X Line speed, fpm X $\frac{12}{60{,}000}$ = Deflection, in.

3.2 msec X 60 fpm X 0.0002 = 0.038 in.

In this example the puller and cutter must be set up to allow for 0.038" of product deflection during cutting. Failure to do this can lead to puller stoppage (which can form annular rings on the product), and poor-quality cuts (hairs or fuzz and angular cuts.

Conair Cutter Blades

Contact Conair Parts for blade recommendations.

Replacement blades are available from Conair.

Contact Conair Parts
(800) 458 1960
From outside of the
United States, call:
(814) 437 6861

All About Cutter Bushings

Rotary knife cutter bushings are probably the most ignored aspect of cutting. Yet, they are probably the most important ingredient to obtaining clean, square, accurate cuts with minimal jamming and broken blades.

This appendix contains information about several aspects of cutter bushings:

- bore characteristics
- bushing length
- shear surface characteristics
- the bushing gap

Cutter bushing bore size

The cutter bushing bore size affects both the cutting process and the overall extrusion process.

Bushings with relatively large bores are often used to facilitate start-up and minimize bushing inventory. While this practice is acceptable for start-up, it will lead to premature blade failure because the bushings do not properly support the blade. For optimum cut quality, make sure the bore adequately supports the tube or profile.

When the blade first makes contact with the tube or profile, it pushes the part until is assumes the size and/or shape of the bushing bore. In the case of tubes this causes two marks on the tube (penetration marks) that show where the tube flattened before the blade actually penetrated it. The tighter the bushing bore size to tube size, the closer the marks become, making them less obvious.

If the bushing bore is too tight, excessive extrudate interruption or even jamming may occur. In turn, this can cause internal air blockage in free extruded flexible materials and thus extrudate size fluctuations. In the case of rigid profiles or tubes, belt puller slippage may occur during the cutting if the bushings are improperly configured. This can cause annular rings around the extrudate and size fluctuations.

- For rigid profiles or tubes, allow 0.010-0.020 inch clearance over the OD tolerance. Anything tighter than 0.010 inch will be difficult to process. For easier startup, allow as much as 1/4 inch above a rigid profile because the blade will force the profile to the bottom of the cutting bushing where the shearing action occurs. However, if perfect squareness is required, the clearance above the profile should be minimized to prevent bowing. Supportive bushings become more important if heat is used to minimize whitening (fracturing).

All about Cutter Bushings (continued)

- If you are cutting a square or rectangular profile, whether rigid or flexible, a round bushing bore will not offer proper support and will often lead to an "S" shaped cut. A flat bottomed bushing will offer excellent support and enhance the shearing action of the blade.

- In the case of flexible extrudates, allow 0.010-0.050 inch clearance depending on durometer and surface; the softer durometers and tacky surfaces require the most clearance. In the case of softer durometer materials, bushing lubrication may be required to minimize drag and material build-up between the cutter bushing faces.

Cutter bushing bore surface quality

The internal surface of the cutter bushing must be smooth and glass-like when cutting flexible extrudates, otherwise excessive drag causes jamming and can lead to variations in cut-to-length accuracy.

- When cutting flexible materials, have the internal surface machined to resemble glass. In many cases, medical processors will actually have the ID of their bushings either honed or burnished for best results.

- When cutting clear extrudates, it is also very important to have a smooth internal surface to minimize scratches. In some cases it may be necessary to make a Teflon or Delrin insert to further minimize drag and/or scratching.

- Bushing lubrication can also help minimize bushing drag.

- Be sure to have a lead-in angle machined into the entrance of the upstream cutter bushing. The transition from the bore to the lead-in angle should not be abrupt as it to can cause variable drag.

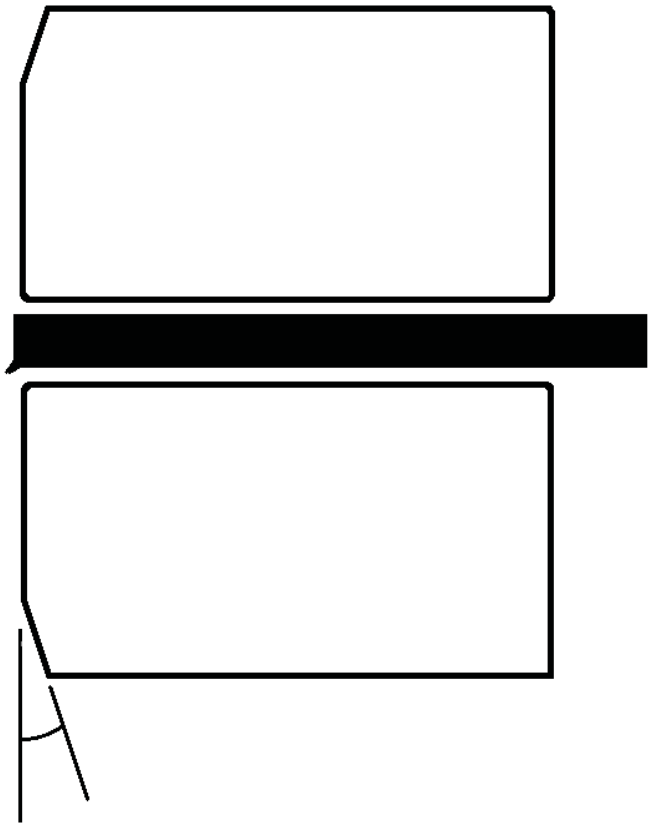
All about Cutter Bushings (continued)

Cutter bushing shear surface quality

Similar to a dull pair of scissors, if the cutter bushing shear surface is not sharp the tube or profile is not supported to the side of the blade and the cut will not be clean. In some cases, the entrance of the downstream cutter bushing is slightly radiused to minimize jamming. While this practice helps accommodate bushing bores that are not quite aligned, it has a negative effect on cut quality.

- The shear surface of both the upstream and downstream cutter bushings should be sharp and bored to the same size. NOTE: In high speed cutting applications, the downstream bushing is sometimes bored 0.005” larger than the upstream bushing to minimize jamming. Deburr the edge after the boring operation, but be careful to remove only the burr and not the edge.

- Leave a minimum land of 1/8 - 1/4 inches on the face of the cutter bushing beyond the bore. Angle the rest of the bushing face with a 10-15 degree lead-in.



All About Cutter Bushings (continued)

Cutter bushing length

⚠ CAUTION: Blade hazard

In order to comply with OSHA regulations, the distance from the sidewall of the cutter to the blade (through the bushing) must be long enough to prevent fingers from reaching the blades.

On flexible extrudates, it is important to minimize the length of the cutter bushings. It is very difficult to push flexible extrudates through since it tends to compress as it is pushed, causing a marginal increase in the tube diameter. For this reason, bushing lubrication may be necessary to minimize drag as the length of the bushings increase. A discharge conveyor may also be helpful in removing longer cut parts. The exit bushing may be funneled to allow the cut part to drop out faster while still maintaining minimal bushing length for safety.

- For flexibles, the upstream cutter bushing should offer total support to the extrudate as close to the nip point of the puller as possible. In this way the part is not able to move from side to side or bow from the weight of the tube, which can, in turn, cause variable drag. You use the strength of the tube to push itself.

- The bore length of the exit bushing should not be shorter than 1 1\2 times the diameter of the tube with the remainder of the bushing length being tapered. On sticky flexible extrudates, the parts will actually stick back together if the new part has to push the cut part out very far.

For rigid extrudates, the length of the cutter bushings can result in a square cut or an angular cut. The cutter bushings support the extrudate keeping it from moving from side to side and bowing from the weight of the profile itself. Many processors make their bushings short to minimize cost of EDM which is determined by depth of cut.

- For rigid extrudates, a general rule is to make the length of the cutting bushings equal to two times the largest outside dimension. NOTE: In the case of full profile cutter bushings where maximum support is offered, the bushing length may be shortened depending on actual clearance.

- Be sure to have a lead-in angle machined into the entrance of the upstream cutter bushing. The transition from the bore to the lead-in angle should not be abrupt as it to can cause variable drag.

All About Cutter Bushings (continued)

Adjusting the cutter bushing gap

If the bushing gap is too big, material is dragged down between the bushings creating a burr, especially with flexibles. This may lead to jamming within the bushings where the upstream side of the cut extrudate actually hits against the downstream bushing surface. This is especially apparent with flexibles with non-concentric walls where a slight bow is present.

- Locate the downstream bushing such that it touches the blade without deflecting it. Lock it in place and rotate the blade to check proper gap.

- Locate the upstream cutter bushing with 0.001-0.002 inch of the blade and lock it in place. Rotate the blade through the set bushings to insure proper gap. NOTE: Because blades are rarely perfectly flat, it is possible that a swishing sound will be heard.

- If hairs are present on only the upstream cut end of a tube or profile, it may be necessary to allow a 0.002-0.005 inch gap on the downstream bushing to allow the blade to slightly move with the extrudate during the cutting cycle and not cause excessive frictional heat which actually melts the extrudate. NOTE: Blade/bushing lubrication can also help to solve this problem.

Blade and Bushing Lubrication

Blade and bushing lubrication can nearly always improve the quality of cutting.

Description of the cutting process

Unlike sawing, a rotary knife cutter displaces material rather than removing it. When the knife blade first contacts the extrudate, it pushes it against the opposite side of the cutter bushings. If there is too much clearance the extrudate may crack or distort before cutting even begins. Tubing may develop two distinctive marks related to the compression of the tube.

Once the blade penetrates the part, material is displaced to either side of the blade. This displacement will vary in degree and visibility depending on the type of material, temperature, blade thickness, blade style, and blade speed. As the material is displaced, heat is generated and passed to the blade surface.

Flexible materials (flexible PVC, urethanes, and even LDPE) will generally compress during cutting, leaving little or no sign of displacement. The cut will appear uniformly glossy and free of fracture. However, a closer look will show very fine lines on the cut face. With flexible materials, these lines will typically show an arc or "S" pattern which can be attributed to compression of the part as the blade passed through.

Rigid materials such as rigid PVC and styrene will tend to fracture during cutting. The cut surface changes from glossy to dull, and finally becomes whitened and rough. Whitening occurs when cutting changes to fracturing: the cut begins to extend in front of the cutting blade, which acts as a wedge. At this point, you can only hope the fracture is controlled, allowing for a square cut.

Friction and heat during cutting

Because most rotary knife cutters don't travel with the flow of the extrusion line, forward motion is interrupted as the blade passes through the plastic tube or profile. This interruption causes friction, which generates heat in the cutting blade. As the temperature of the blade increases, plastic is melted at the cut site. This melted plastic can adhere to and coat the cutting blade, especially on the upstream side, and be transferred to the next part in the form of hairs or tissue-like film. This will be especially noticeable on the top inside of the tube or profile.

Blade and Bushing Lubrication

Friction and heat during cutting (continued)

If the blade has a rough surface where the extrudate rubs against it, material will accumulate on the blade in a cheese grater fashion. This scratched material will also be passed from the blade to the next cut and be seen as hairs or flakes.

Some of the more flexible materials, such as silicones, soft urethanes and flexible PVCs, also exhibit drag against the blade during the cutting cycle. The part will actually stick to the side of the blade and drag down between the bushings. Typically a small "C" shaped tail of the tube will accumulate in the bottom of the cutting chamber. This tail actually tore off the tube rather than cut due to the excessive drag against the blade

The generation of heat during cutting can also lead to parts that stick to each other. They may appear to be welded together, and an extra operation may be required to separate them. This can be a real problem in materials such as latex, silicone, PP, and flexible PVC.

Benefits of using lubricants

The primary benefit of using a cutting lubricant is reducing friction. If the cutting blade is coated with a film of lubricant, the coefficient of friction between the blade and the plastic tube or profile is reduced, reducing the generation of frictional heat.

Lubricants also minimize the tendency for material to stick to the blade, thus minimizing the potential for material to be wiped on the next cut part. The co-efficient of friction is reduced with varying degrees, depending on the type of lubricant, which in turn limits the increase in blade temperature. Over time this can lead to an increase in blade life because the cutting edge will last longer at cooler operating temperatures.

While lubricants can also help minimize problems caused by rough or poorly ground blades and cutter bushings, it is generally better to solve the problem than mask it with lubricants.

Blade and Bushing Lubrication (continued)

Common cutting lubricants

Commonly used general purpose lubricants include:

- Tap water
- Dish washing liquid (Joy, etc)
- Glycol (anti-freeze, coolant)
- Water-soluble silicone cutting oils
- Diesel fuel
- Mold release
- Mineral oil

Medical grade lubricants:

- Distilled water
- Isopropanol (isopropyl alcohol)
- Mixtures of isopropanol and water

Lubrication systems

The most basic blade lubrication system for rotary knife cutters is using a stainless steel tray filled with the lubricant. Because the cutting blade passes through the tray during every cutting cycle, the blade is lubricated before each cut. This approach limits material buildup on blade and bushing surfaces for most applications. Care must be taken to maintain the lubricant level within the tray. Clean out accumulated cut residue on a regular basis.

Spray mist systems can be used to lubricate either the blade or the extrudate as it enters the cutter bushings. These systems allow the application of a minimum amount of lubricant with good consistency. If the mist is applied to the product as it enters the cutter bushings, the lubricant will minimize the drag between the bushing bore and the tube or profile, as well as wet the blade and bushing faces. With flexible and/or sticky materials this can improve both cut quality and cut-to-length accuracy.

The last method of blade lubrication (and the oldest) is the blade wipe system. Felt, sponge, or some other absorbent material is mounted so the rotary knife blade will pass through it, with interference, before making a cut. Typically a gravity drip or wick system is used to keep the absorbent material wet with lubricant. These systems not only lubricate the blade, but also wipe off residue before each cut. However, the operator must constantly observe the condition of the pads as they wear quickly and lose their function. Another concern (especially in medical applications) is what happens to wear particles from the pads. This material frequently ends up on the blade itself, and is then transferred to the very product it is meant to protect from contamination.be especially noticeable on the top inside of the tube or profile.

Choosing Belt Materials

When considering puller performance, an important concern is the type of puller belt. To select the proper belt material, you must consider the extrudate's tendency to deform under pressure. For example, thin wall profiles and tubing are prone to deformation, so you need lower pressures and longer traction lengths to deliver the required pulling force without deformation and slippage.

Various belt materials are available: natural rubber, neoprene, urethane, and dual material. Available belts are listed under Conair Belts in this Appendix.

Conair Belts

Part No.	Material	Durometer	Covering Thickness	Color	Wear	Traction	FDA Approved
Model 1-12							
Belt type: Goodyear PD							
3511-30112	Natural rubber FDA	50-55	. in (2mm)	white	medium-excellent	excellent	Yes
173-047-02	Nitrile sponge FDA		. in (4mm)	white	medium-excellent	medium	Yes

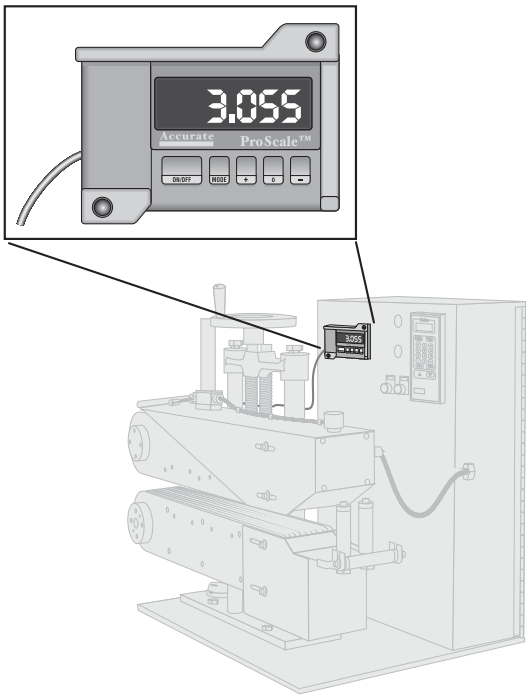
Using the Digital Belt Gap Sensor

The digital belt gap sensor uses a linear scale attached to both belts to measure the relative distance between the belts. The relative distance is shown in thousandths of an inch (.001). The sensor has five buttons:

- (On/Off) - Turns the device on and off.
- (Mode) - Press to choose the readout in decimals, fractions, or millimeters.
- **(+)** - Press to move up one engineering unit.
- (0) - Press to zero the reading. Because all measurements are relative, the sensor can be set to zero at any time by pressing this button.
- **(-)** - Press to move down one engineering unit.

Readings displays are shown on the digital display.

For more information, refer to the belt gap sensor manual.



Adjusting the Pneumatic Upper Belt Actuator

You can adjust the opening and closing speed of the air cylinder assembly that operates the upper belt boom assembly by adjusting (lifting and turning) the air regulator handle.